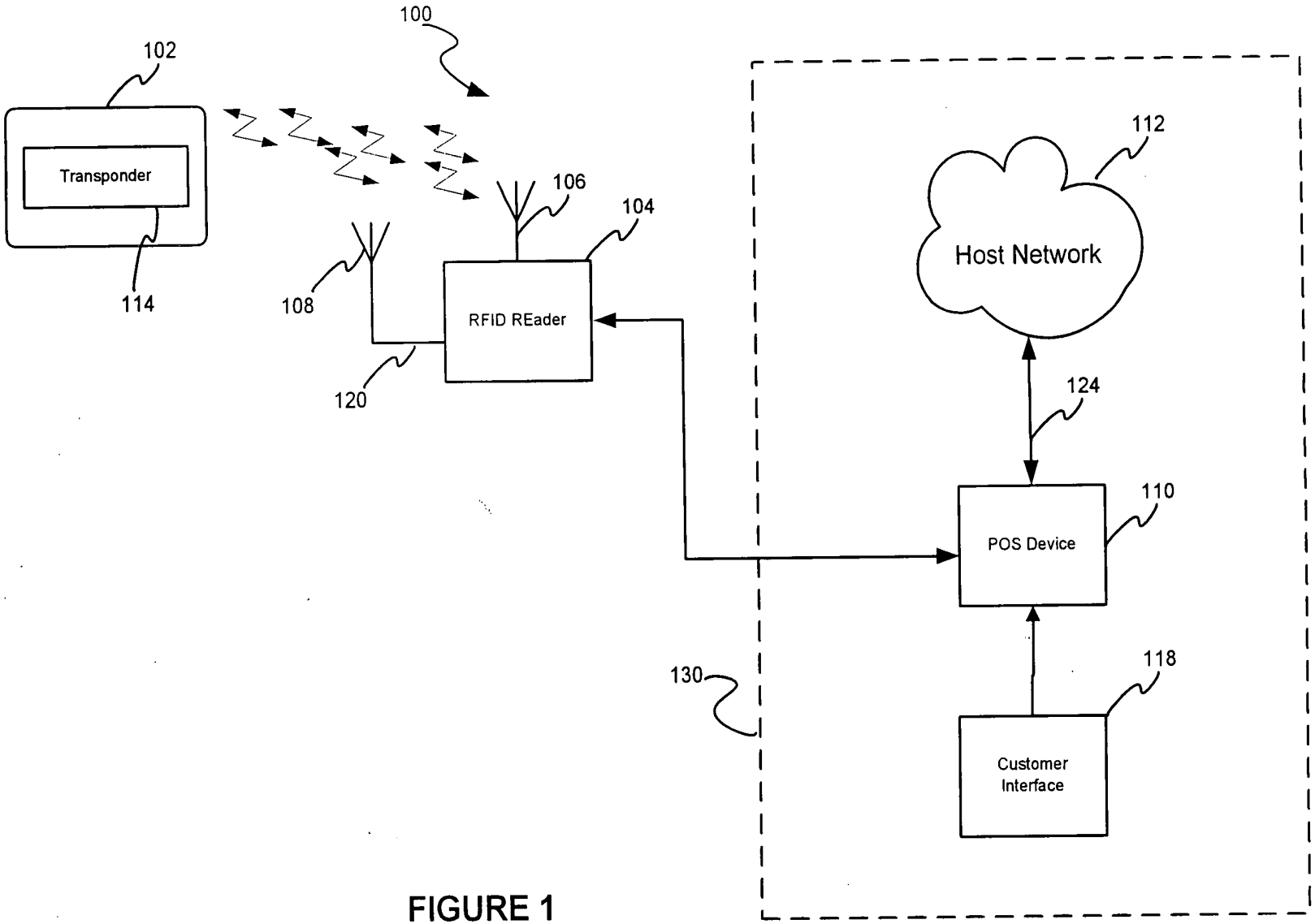

100
102
Transponder
114
106
104
108
RFID REader
120
112
Host Network
124
110
POS Device
130
118
Customer Interface

FIGURE 1

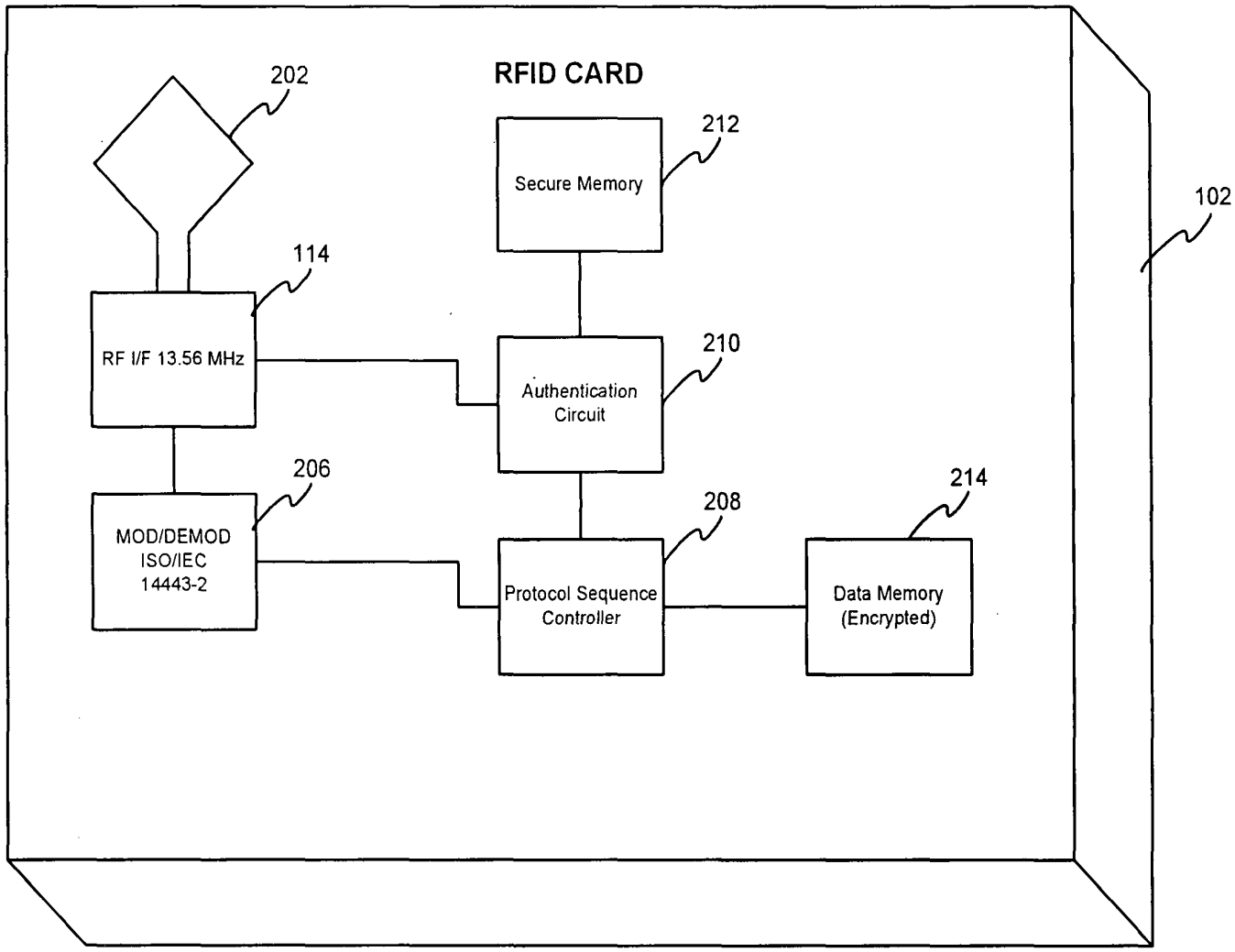

RFID CARD
202
212
Secure Memory
102
114
RF I/F 13.56 MHz
210
Authentication Circuit
206
214
208
MOD/DEMOD ISO/IEC 14443-2
Protocol Sequence Controller
Data Memory (Encrypted)

FIGURE 2

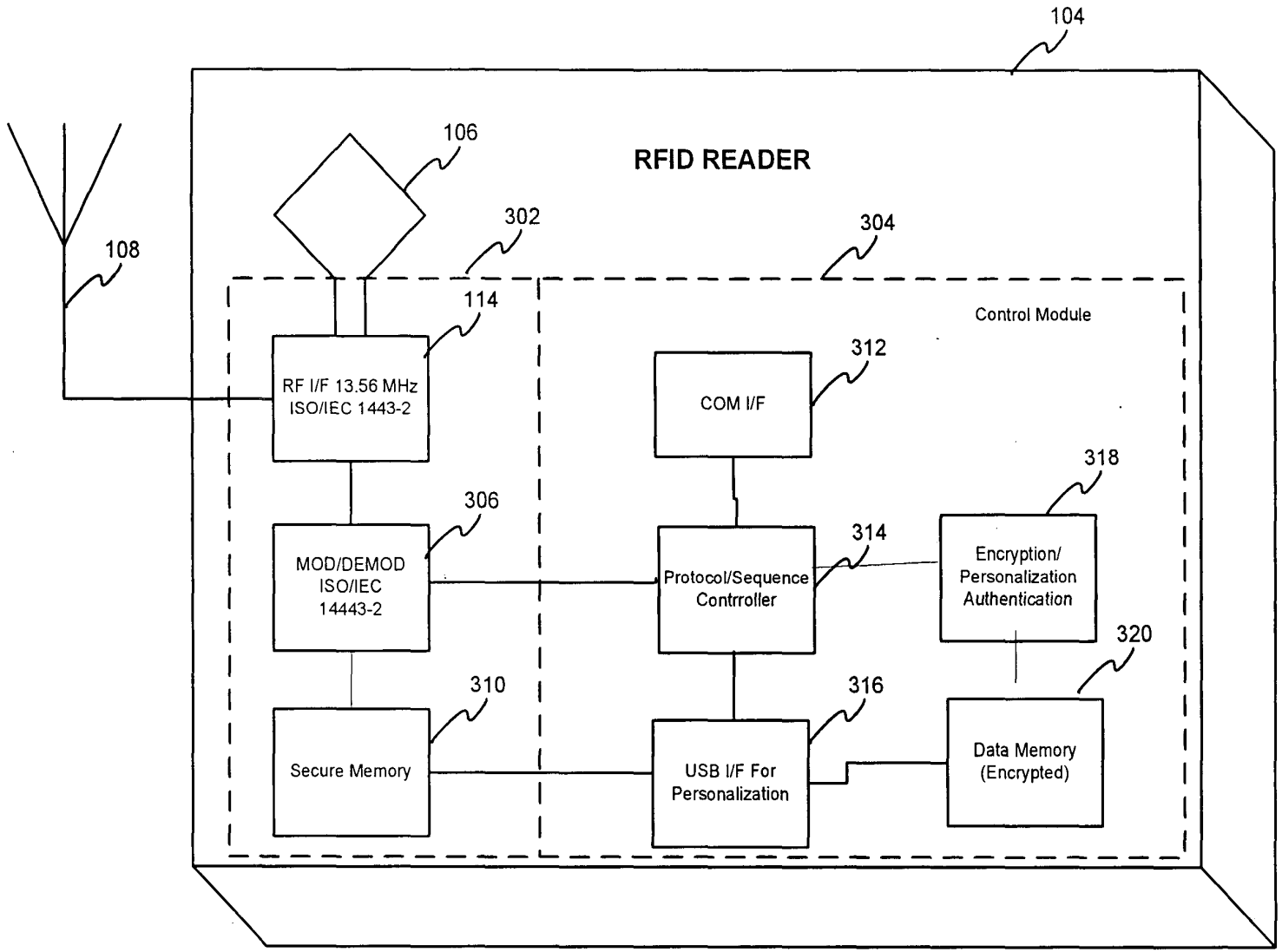

104
RFID READER
106
108
302
304
114
Control Module
RF I/F 13.56 MHz
ISO/IEC 1443-2
312
COM I/F
318
306
MOD/DEMOD
ISO/IEC
14443-2
314
Protocol/Sequence
Contrroller
Encryption/
Personalization
Authentication
320
310
316
Secure Memory
USB I/F For
Personalization
Data Memory
(Encrypted)

FIGURE 3

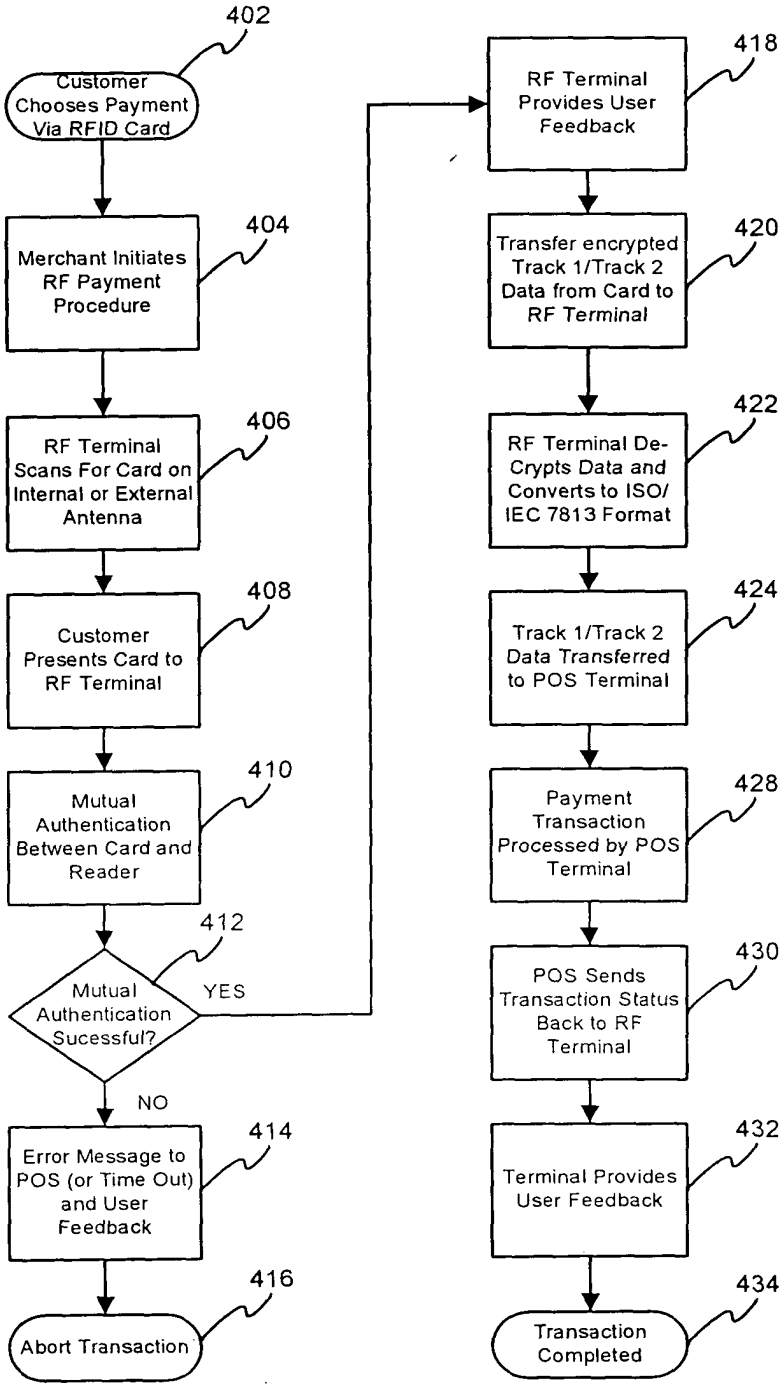
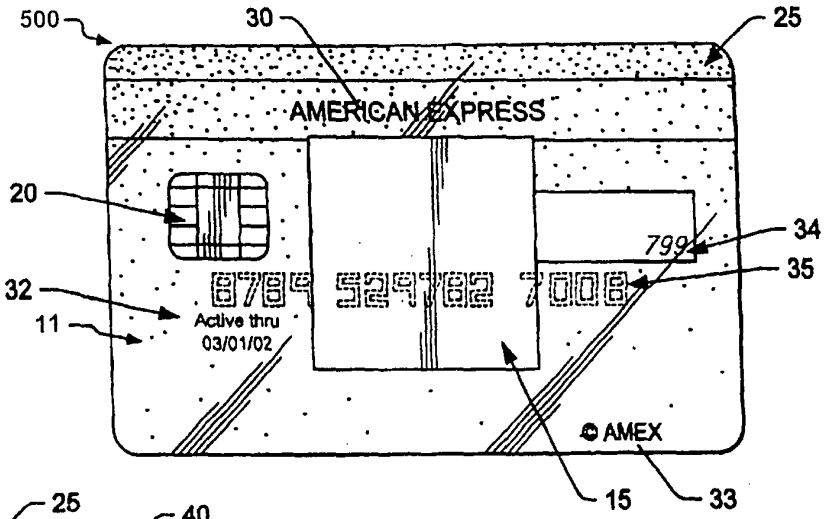

402
Customer Chooses Payment Via RFID Card
404
Merchant Initiates RF Payment Procedure
406
RF Terminal Scans For Card on Internal or External Antenna
408
Customer Presents Card to RF Terminal
410
Mutual Authentication Between Card and Reader
412
Mutual Authentication Sucessful?
YES
NO
414
Error Message to POS (or Time Out) and User Feedback
416
Abort Transaction
418
RF Terminal Provides User Feedback
420
Transfer encrypted Track 1/Track 2 Data from Card to RF Terminal
422
RF Terminal De-Crypts Data and Converts to ISO/IEC 7813 Format
424
Track 1/Track 2 Data Transferred to POS Terminal
428
Payment Transaction Processed by POS Terminal
430
POS Sends Transaction Status Back to RF Terminal
432
Terminal Provides User Feedback
434
Transaction Completed

FIGURE 4

FIGURE 5



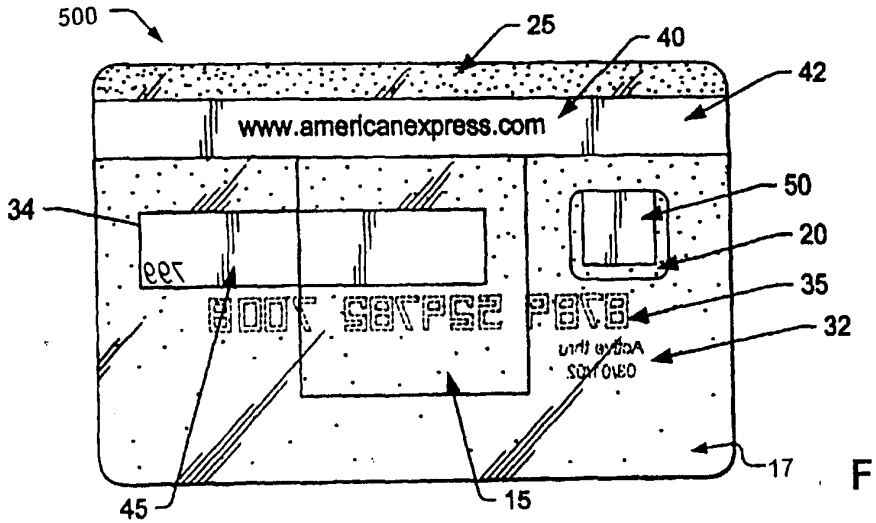


FIGURE 6

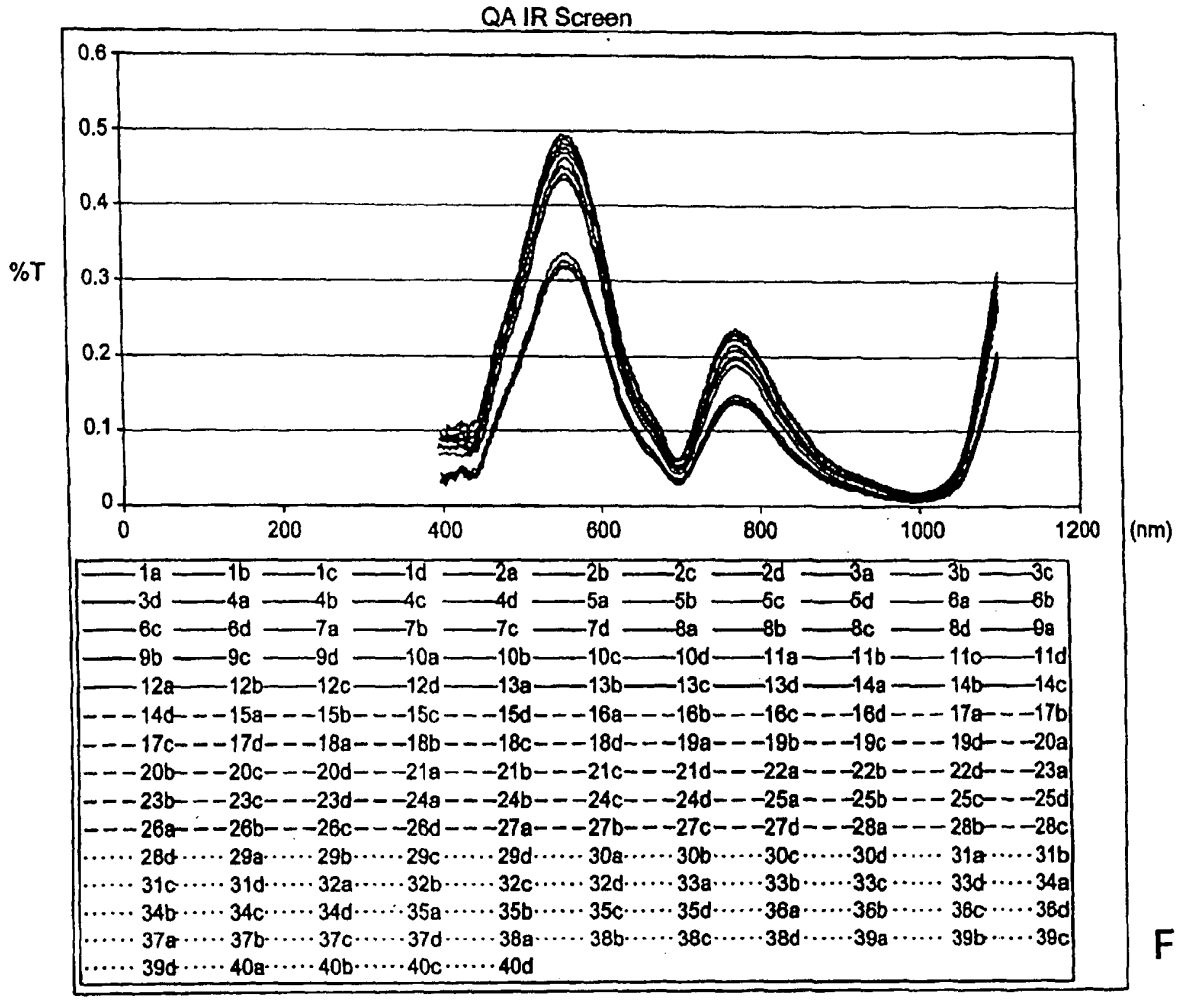

QA IR Screen
%T
0.6
0.5
0.4
0.3
0.2
0.1
0
0
200
400
600
800
1000
1200
(nm)
1a 1b 1c 1d 2a 2b 2c 2d 3a 3b 3c
3d 4a 4b 4c 4d 5a 5b 6c 6d 6a 6b
6c 6d 7a 7b 7c 7d 8a 8b 8c 8d 9a
9b 9c 9d 10a 10b 10c 10d 11a 11b 11c 11d
12a 12b 12c 12d 13a 13b 13c 13d 14a 14b 14c
14d 15a 15b 15c 15d 16a 16b 16c 16d 17a 17b
17c 17d 18a 18b 18c 18d 19a 19b 19c 19d 20a
20b 20c 20d 21a 21b 21c 21d 22a 22b 22d 23a
23b 23c 23d 24a 24b 24c 24d 25a 25b 25c 25d
26a 26b 26c 26d 27a 27b 27c 27d 28a 28b 28c
28d 29a 29b 29c 29d 30a 30b 30c 30d 31a 31b
31c 31d 32a 32b 32c 32d 33a 33b 33c 33d 34a
34b 34c 34d 35a 35b 35c 35d 36a 36b 36c 36d
37a 37b 37c 37d 38a 38b 38c 38d 39a 39b 39c
39d 40a 40b 40c 40d

FIGURE 7A

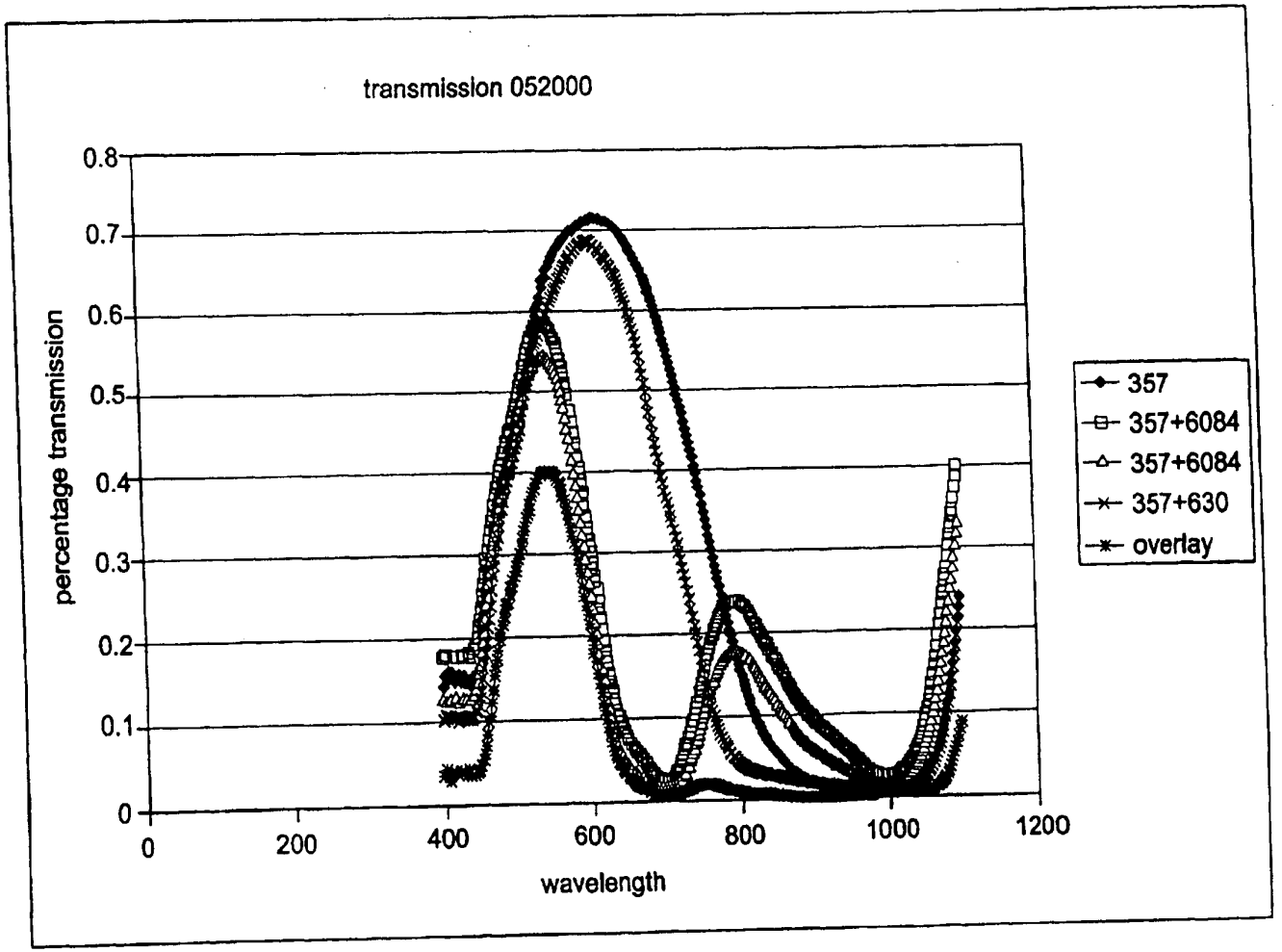

transmission 052000
percentage transmission
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
200
400
600
800
1000
1200
wavelength
357
357+6084
357+6084
357+630
overlay

FIGURE 7B

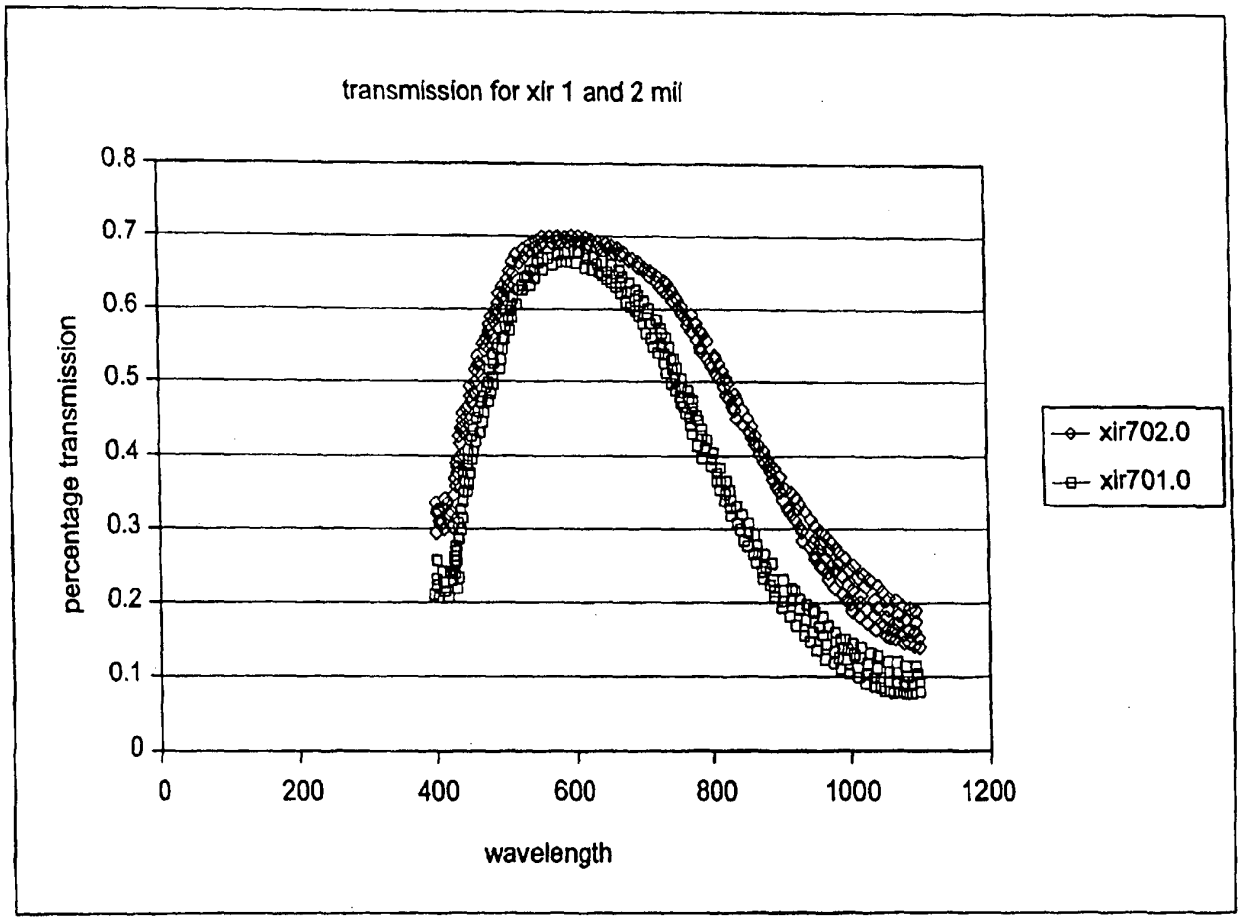

transmission for xlr 1 and 2 mil
percentage transmission
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
200
400
600
800
1000
1200
wavelength
xlr702.0
xlr701.0

FIGURE 7C

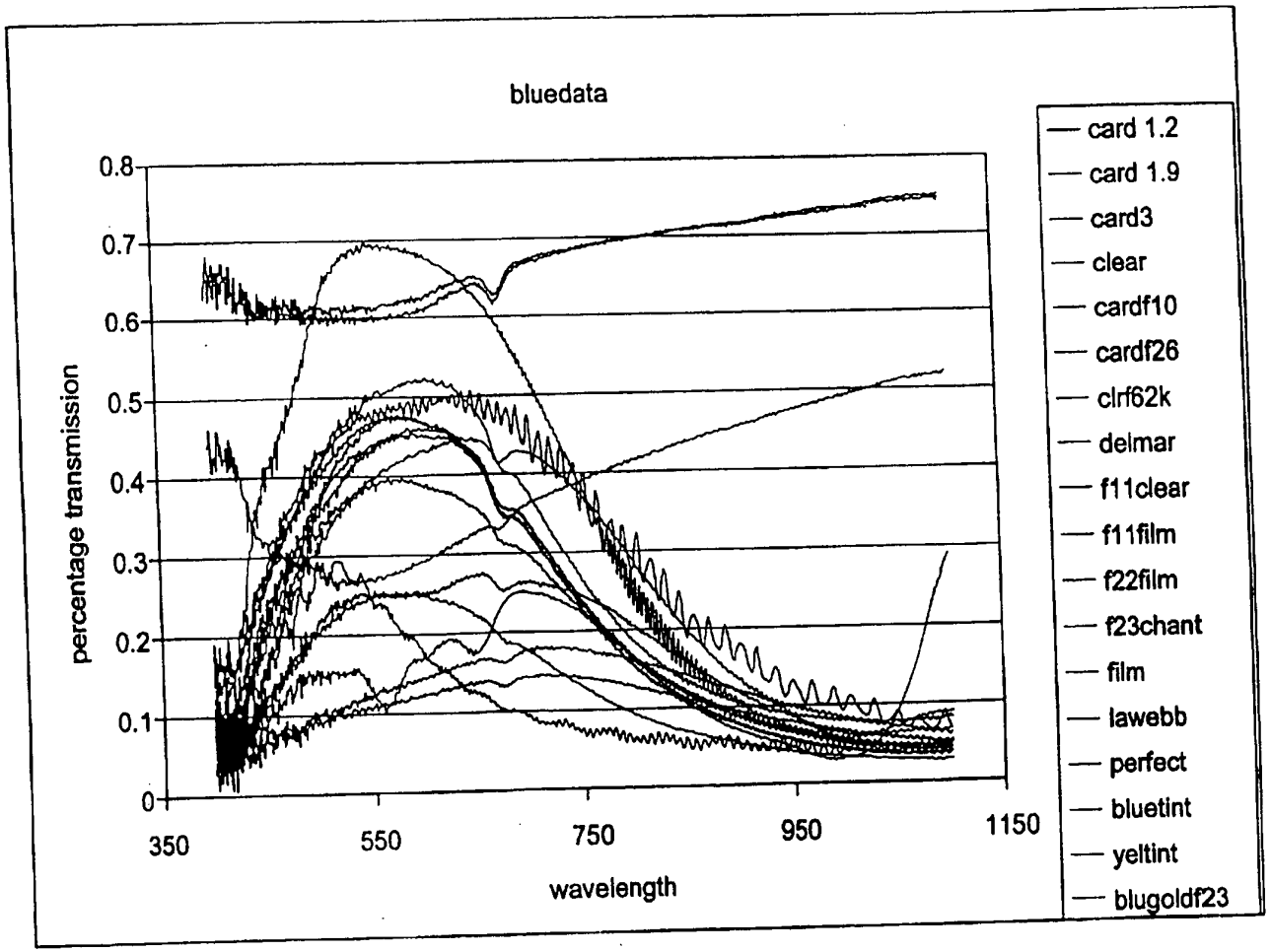

bluedata
percentage transmission
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
350
550
750
950
1150
wavelength
card 1.2
card 1.9
card3
clear
cardf10
cardf26
clrf62k
delmar
f11clear
f11film
f22film
f23chant
film
lawebb
perfect
bluetint
yeltint
blugoldf23

FIGURE 7D

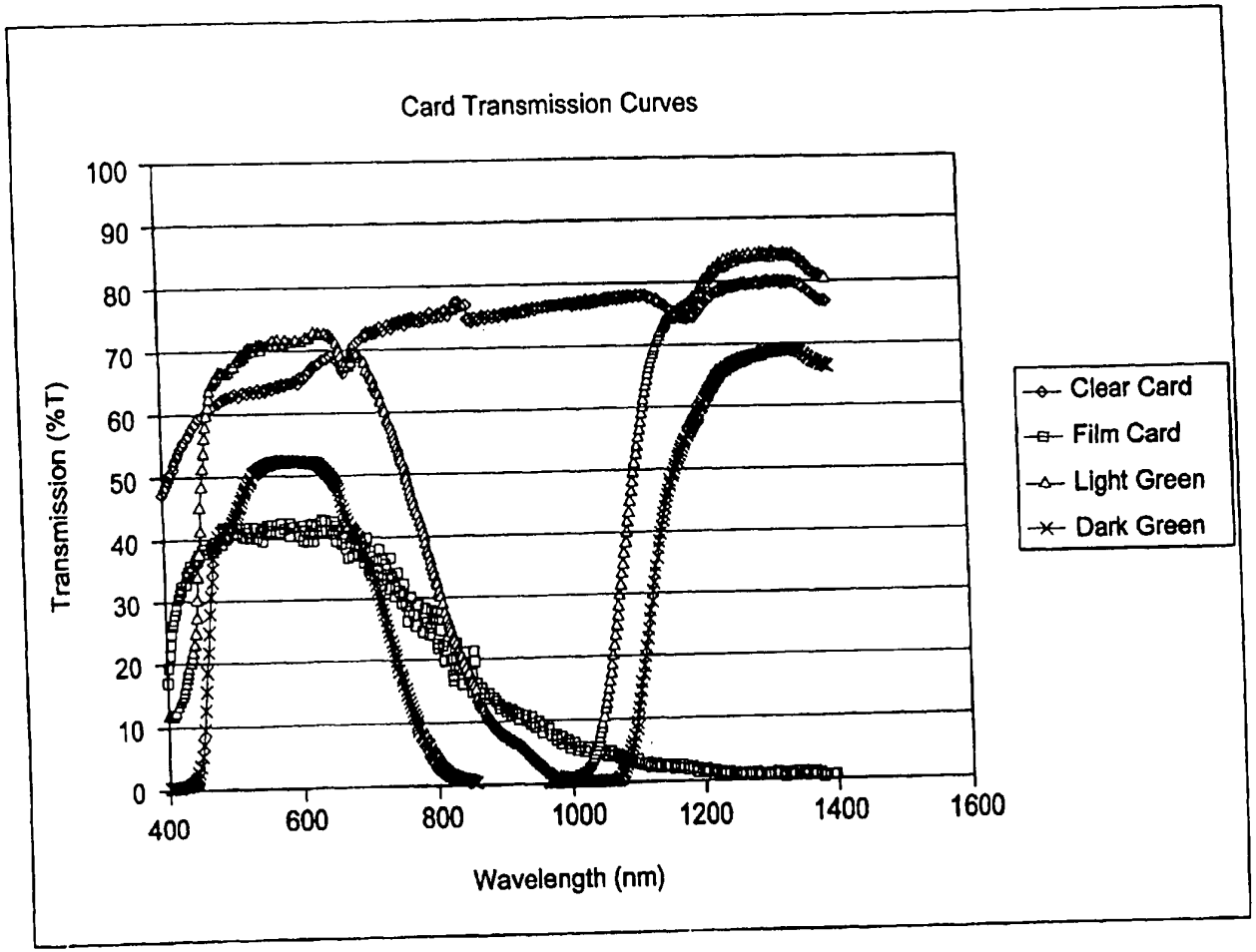

Card Transmission Curves
Transmission (%T)
100
90
80
70
60
50
40
30
20
10
0
400
600
800
1000
1200
1400
1600
Wavelength (nm)
Clear Card
Film Card
Light Green
Dark Green

FIGURE 7E

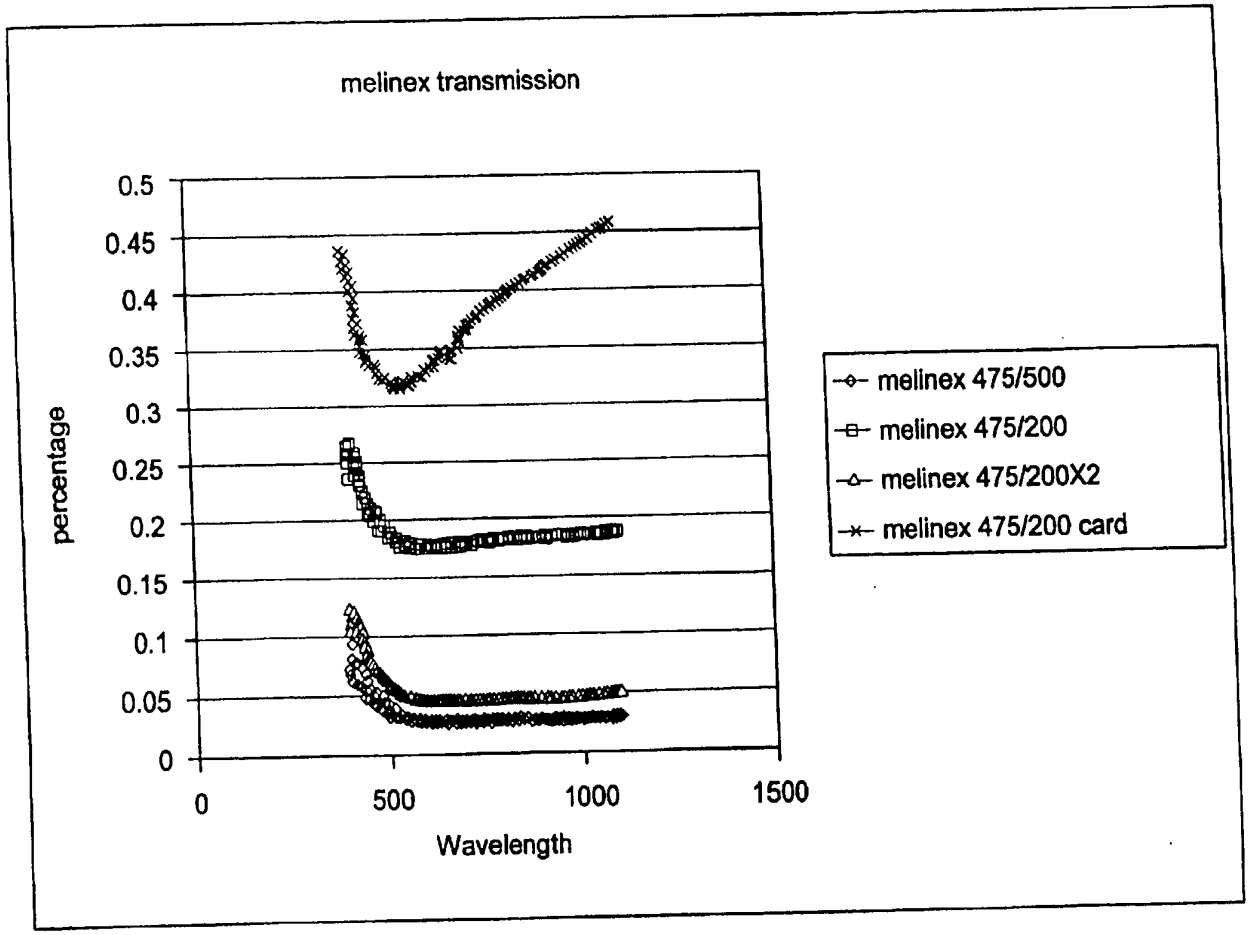

melinex transmission
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
percentage
0
500
1000
1500
Wavelength
melinex 475/500
melinex 475/200
melinex 475/200X2
melinex 475/200 card

FIGURE 7F

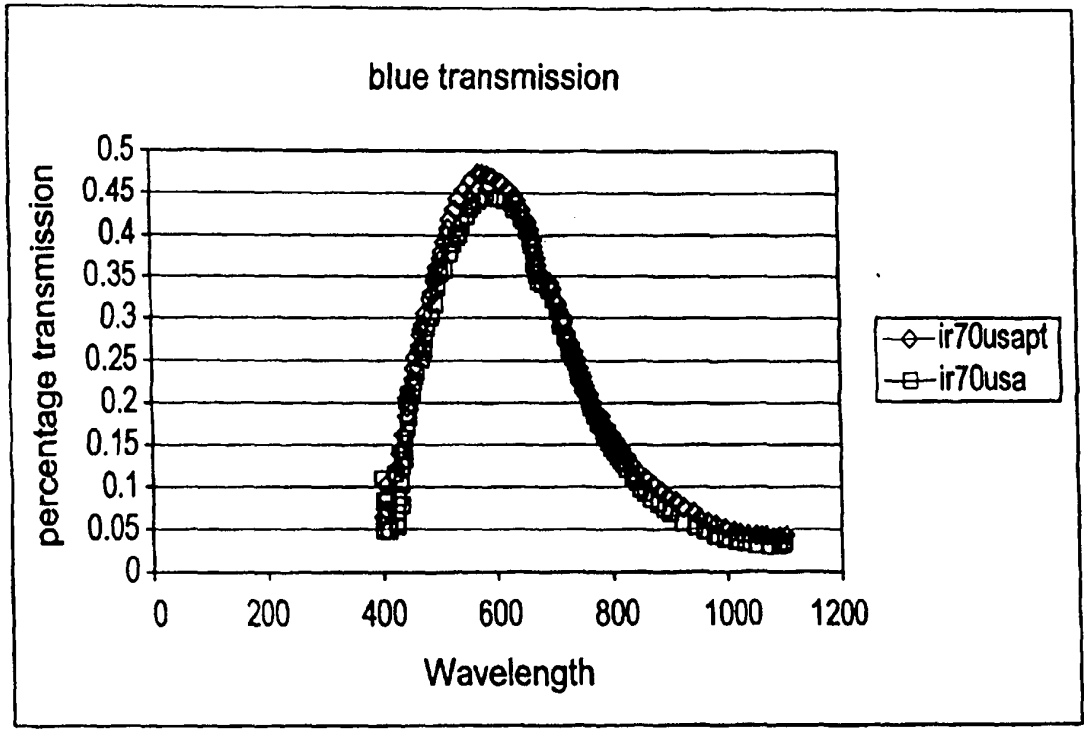

blue transmission
percentage transmission
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
200
400
600
800
1000
1200
Wavelength
ir70usapt
ir70usa

FIGURE 7G

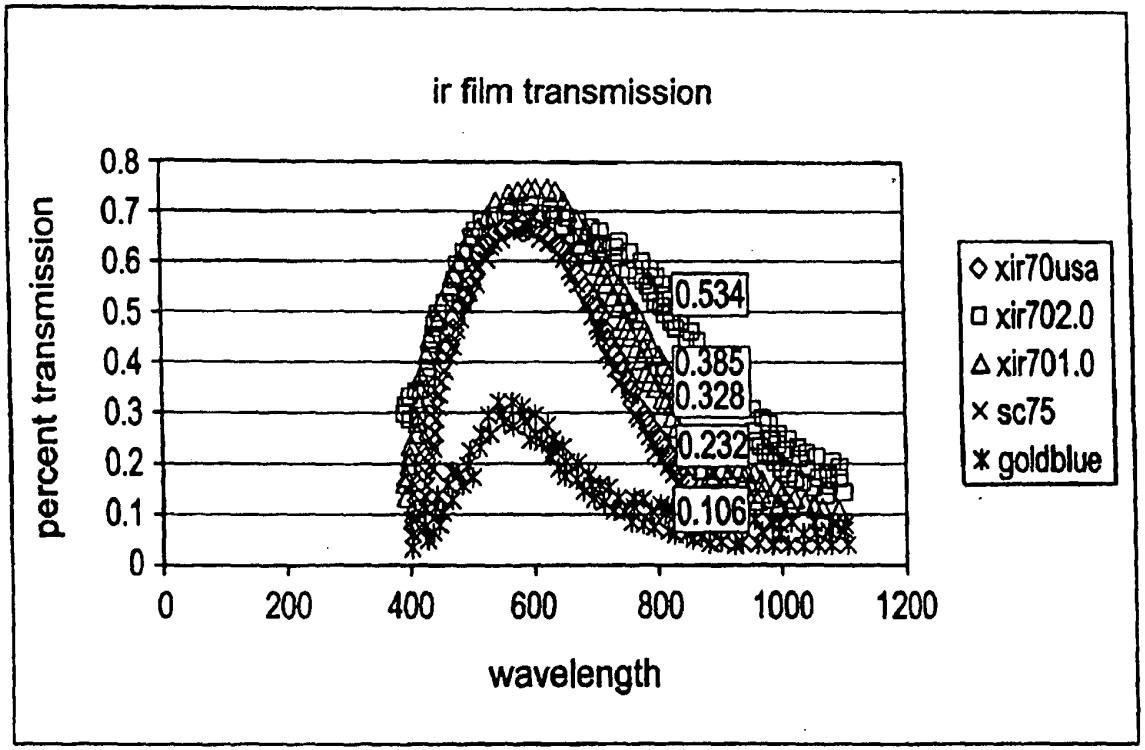

ir film transmission
percent transmission
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
200
400
600
800
1000
1200
wavelength
0.534
0.385
0.328
0.232
0.106
xir70usa
xir702.0
xir701.0
sc75
goldblue

FIGURE 7H

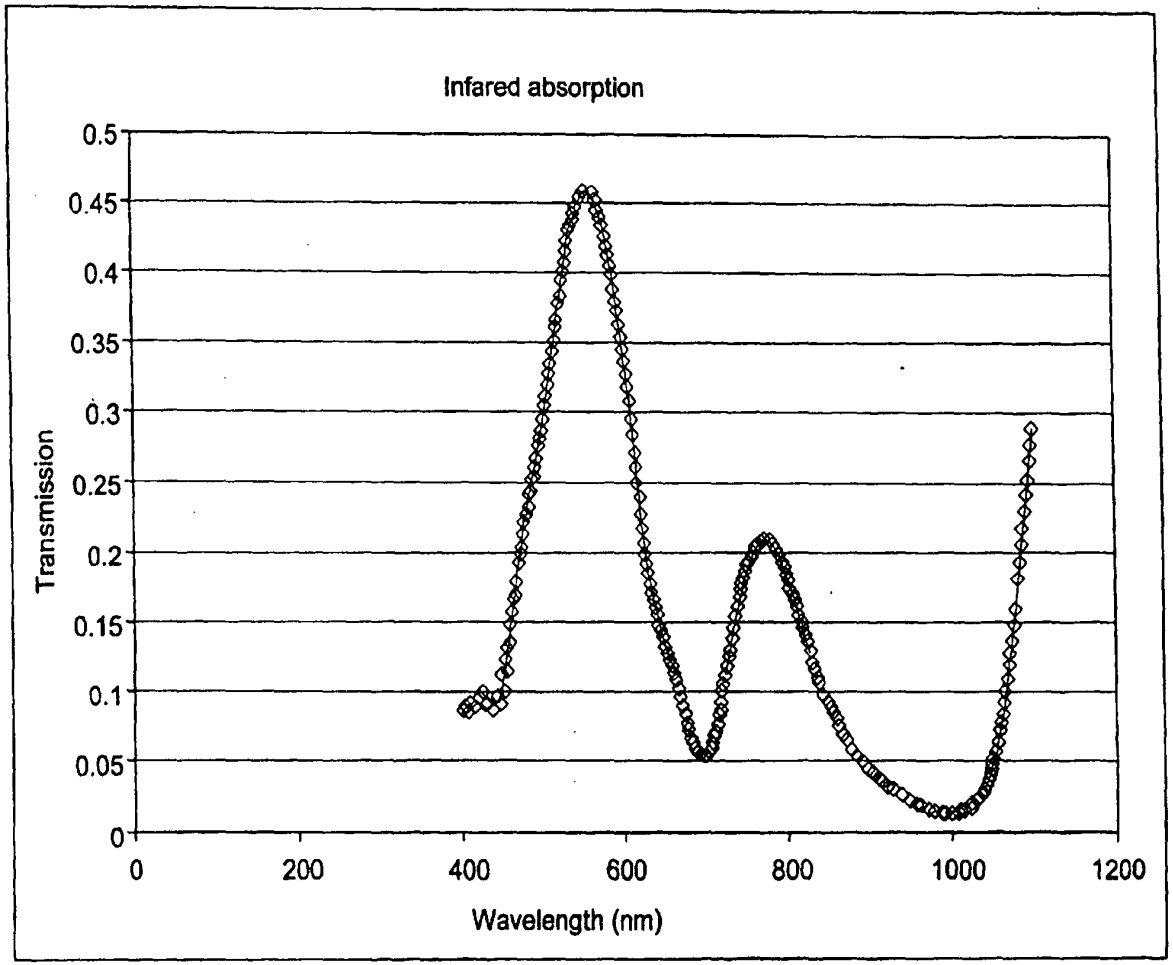

Infared absorption
Transmission
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
200
400
600
800
1000
1200
Wavelength (nm)

FIGURE 7I

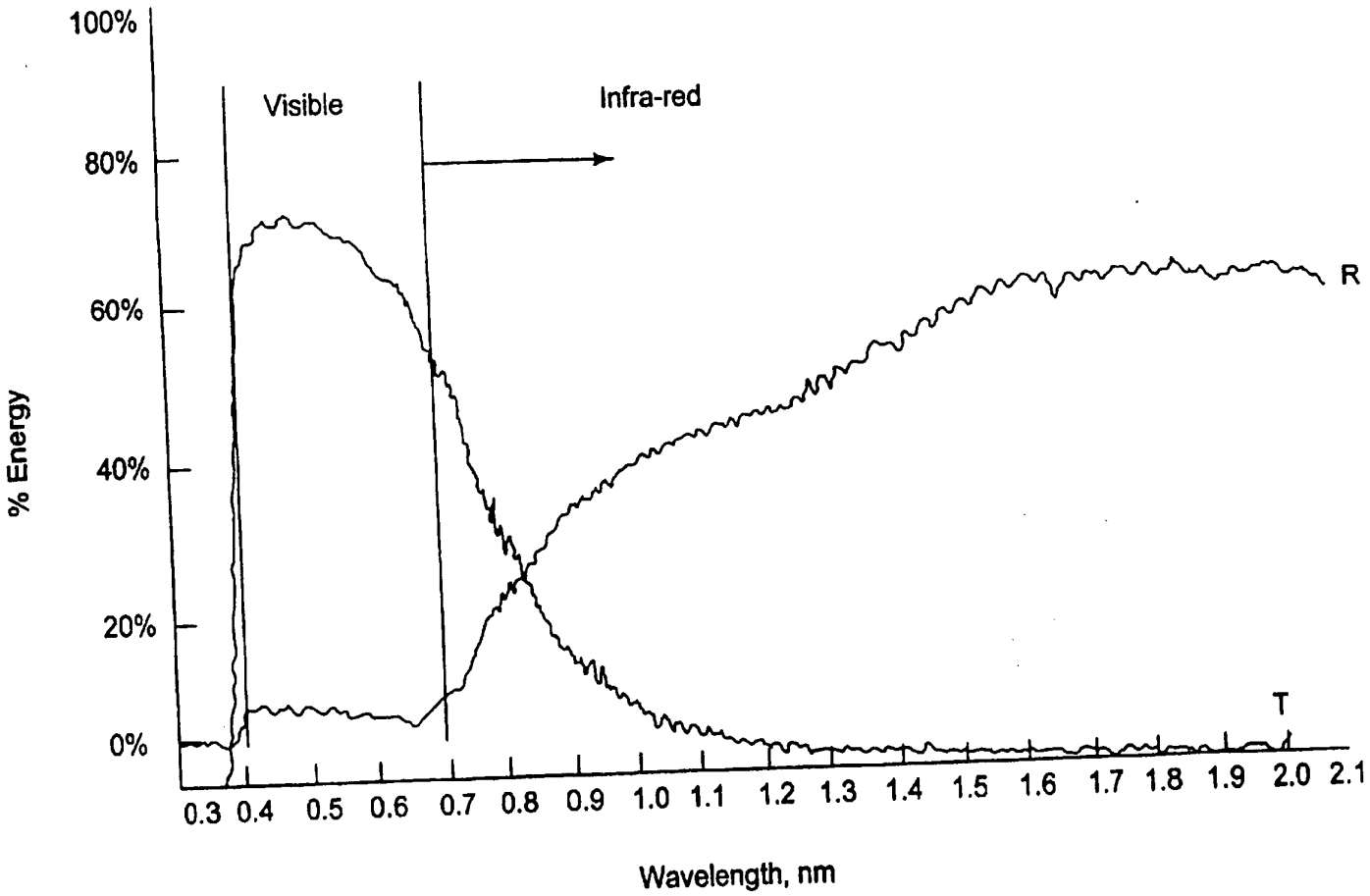

100%
80%
60%
40%
20%
0%
% Energy
Visible
Infra-red
R
T
0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1
Wavelength, nm

FIGURE 8

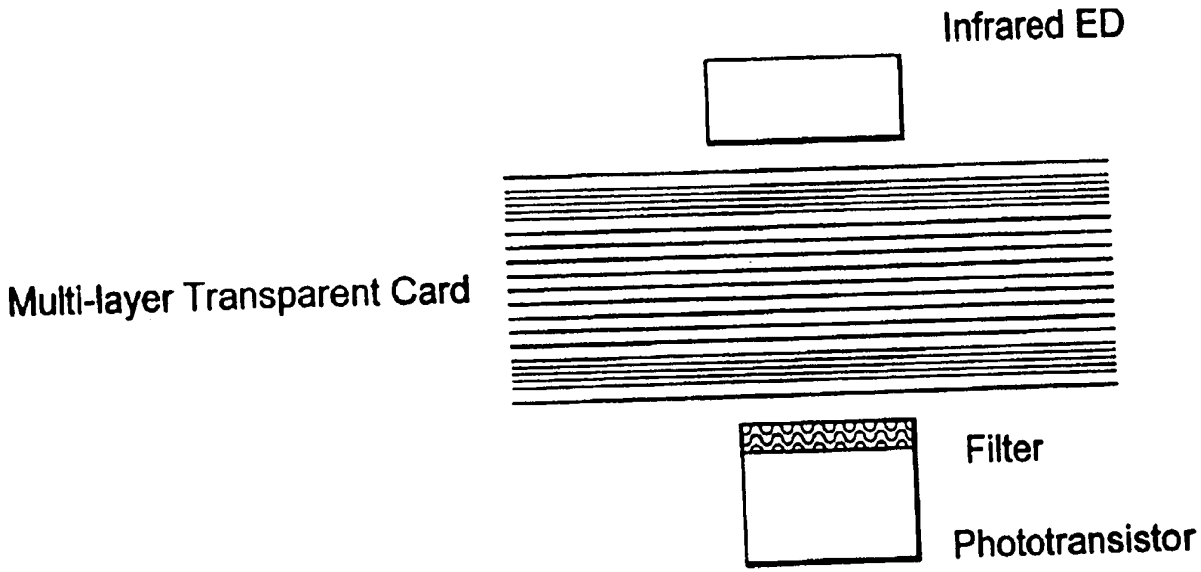

Infrared ED
Multi-layer Transparent Card
Filter
Phototransistor

FIGURE 9

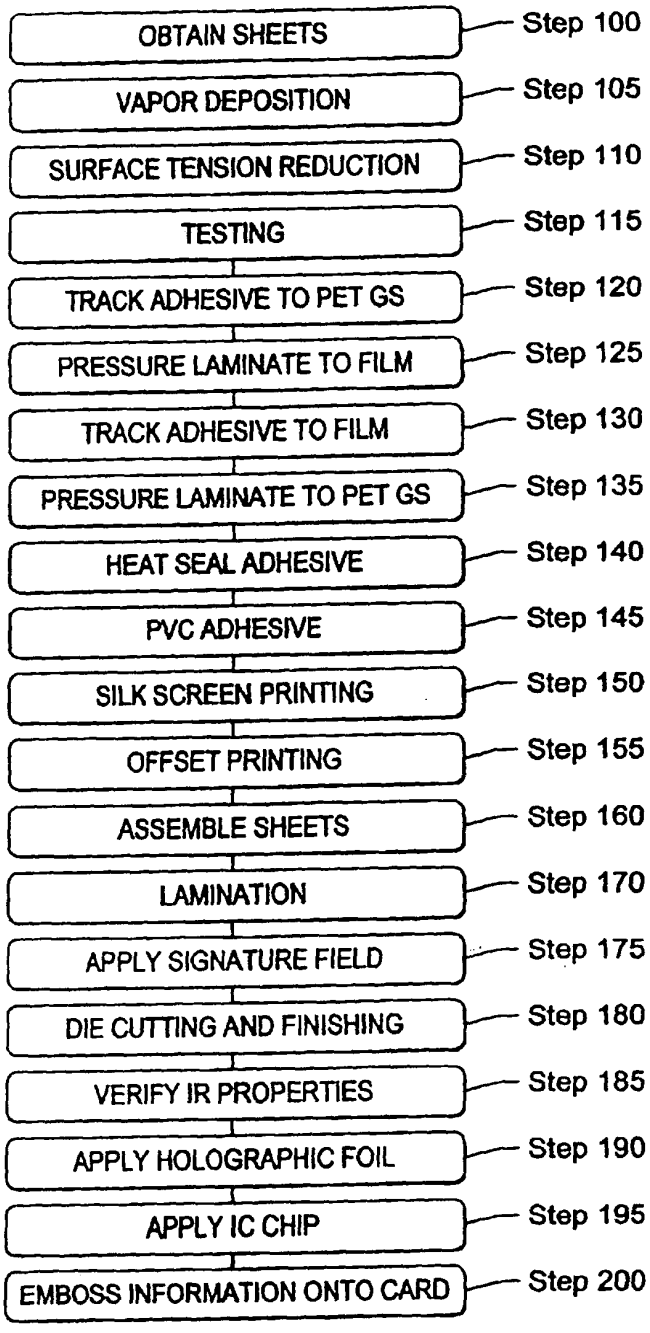
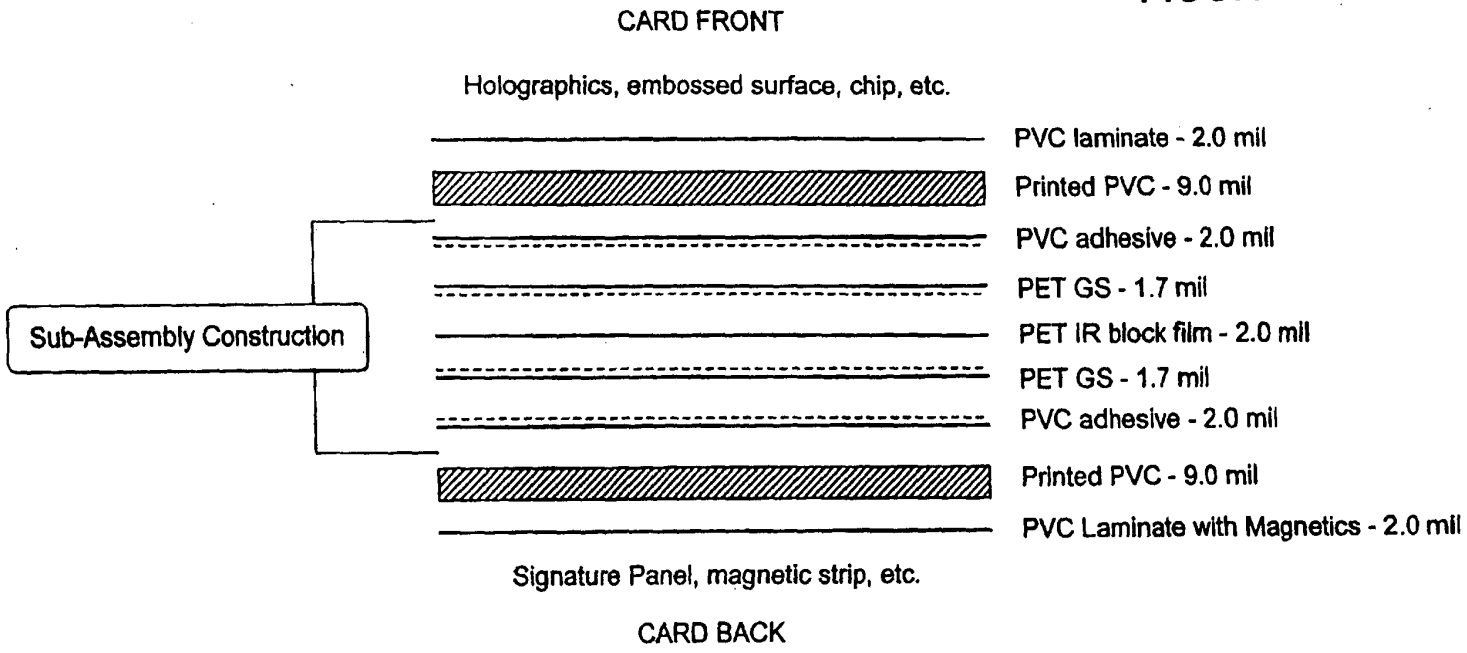

OBTAIN SHEETS
Step 100
VAPOR DEPOSITION
Step 105
SURFACE TENSION REDUCTION
Step 110
TESTING
Step 115
TRACK ADHESIVE TO PET GS
Step 120
PRESSURE LAMINATE TO FILM
Step 125
TRACK ADHESIVE TO FILM
Step 130
PRESSURE LAMINATE TO PET GS
Step 135
HEAT SEAL ADHESIVE
Step 140
PVC ADHESIVE
Step 145
SILK SCREEN PRINTING
Step 150
OFFSET PRINTING
Step 155
ASSEMBLE SHEETS
Step 160
LAMINATION
Step 170
APPLY SIGNATURE FIELD
Step 175
DIE CUTTING AND FINISHING
Step 180
VERIFY IR PROPERTIES
Step 185
APPLY HOLOGRAPHIC FOIL
Step 190
APPLY IC CHIP
Step 195
EMBOSS INFORMATION ONTO CARD
Step 200

FIGURE 10

FIGURE 11A


CARD FRONT
Holographics, embossed surface, chip, etc.
PVC laminate - 2.0 mil
Printed PVC - 9.0 mil
PVC adhesive - 2.0 mil
PET GS - 1.7 mil
Sub-Assembly Construction
PET IR block film - 2.0 mil
PET GS - 1.7 mil
PVC adhesive - 2.0 mil
Printed PVC - 9.0 mil
PVC Laminate with Magnetics - 2.0 mil
Signature Panel, magnetic strip, etc.
CARD BACK

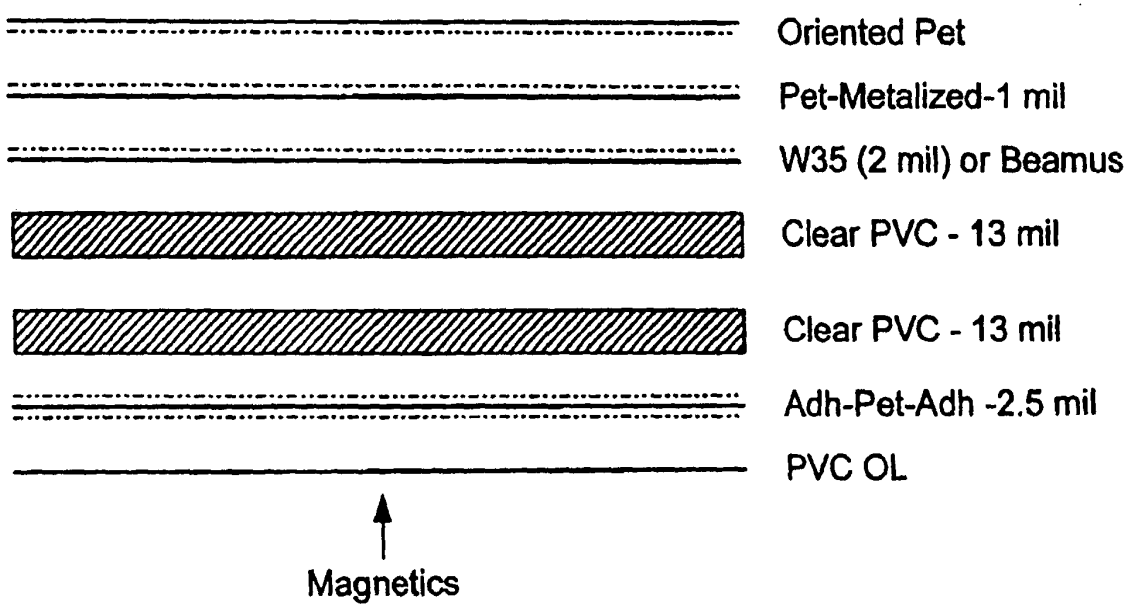

Oriented Pet
Pet-Metalized-1 mil
W35 (2 mil) or Beamus
Clear PVC - 13 mil
Clear PVC - 13 mil
Adh-Pet-Adh -2.5 mil
PVC OL
Magnetics

FIGURE 11B

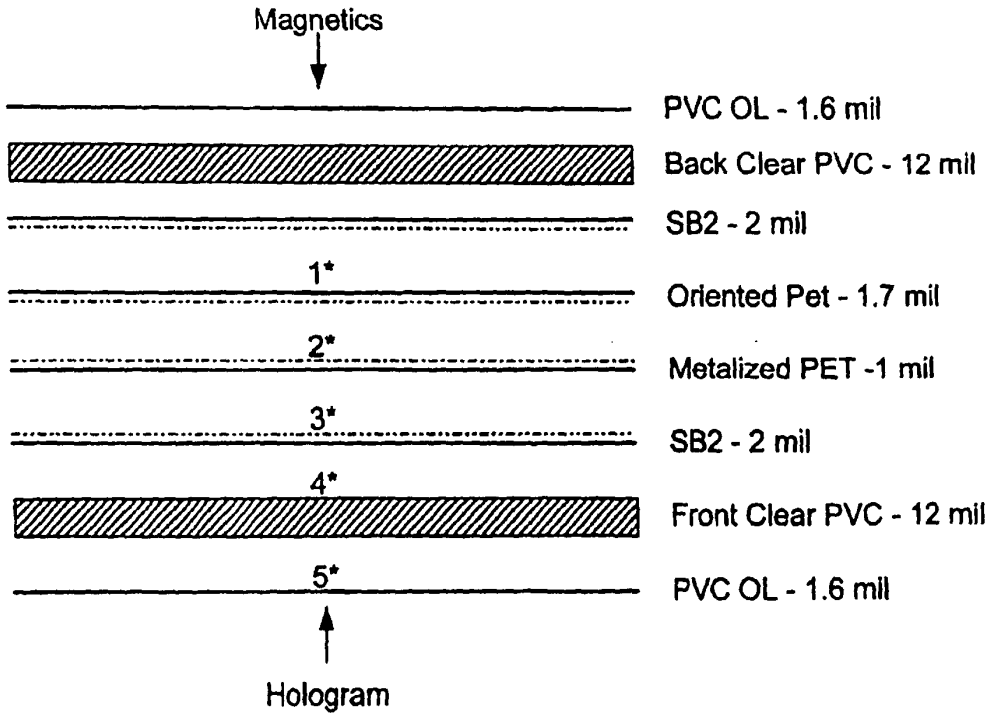

Magnetics
PVC OL - 1.6 mil
Back Clear PVC - 12 mil
SB2 - 2 mil
1*
Oriented Pet - 1.7 mil
2*
Metalized PET -1 mil
3*
SB2 - 2 mil
4*
Front Clear PVC - 12 mil
5*
PVC OL - 1.6 mil
Hologram

FIGURE 11C

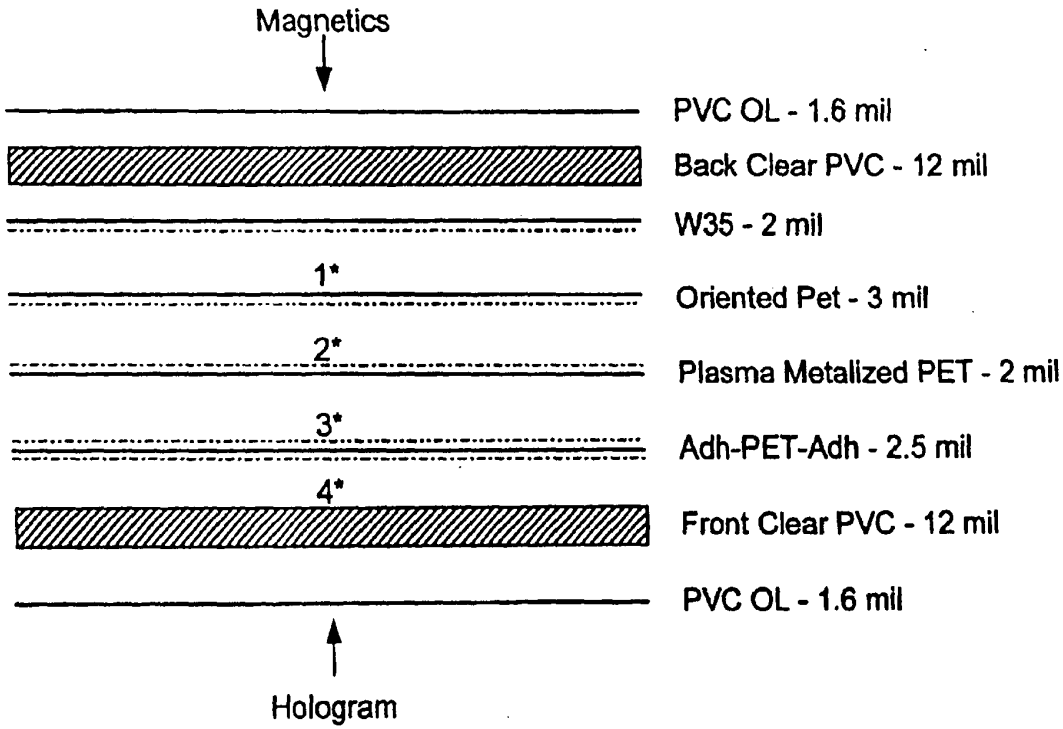

Magnetics
PVC OL - 1.6 mil
Back Clear PVC - 12 mil
W35 - 2 mil
1*
Oriented Pet - 3 mil
2*
Plasma Metalized PET - 2 mil
3*
Adh-PET-Adh - 2.5 mil
4*
Front Clear PVC - 12 mil
PVC OL - 1.6 mil
Hologram

FIGURE 11D

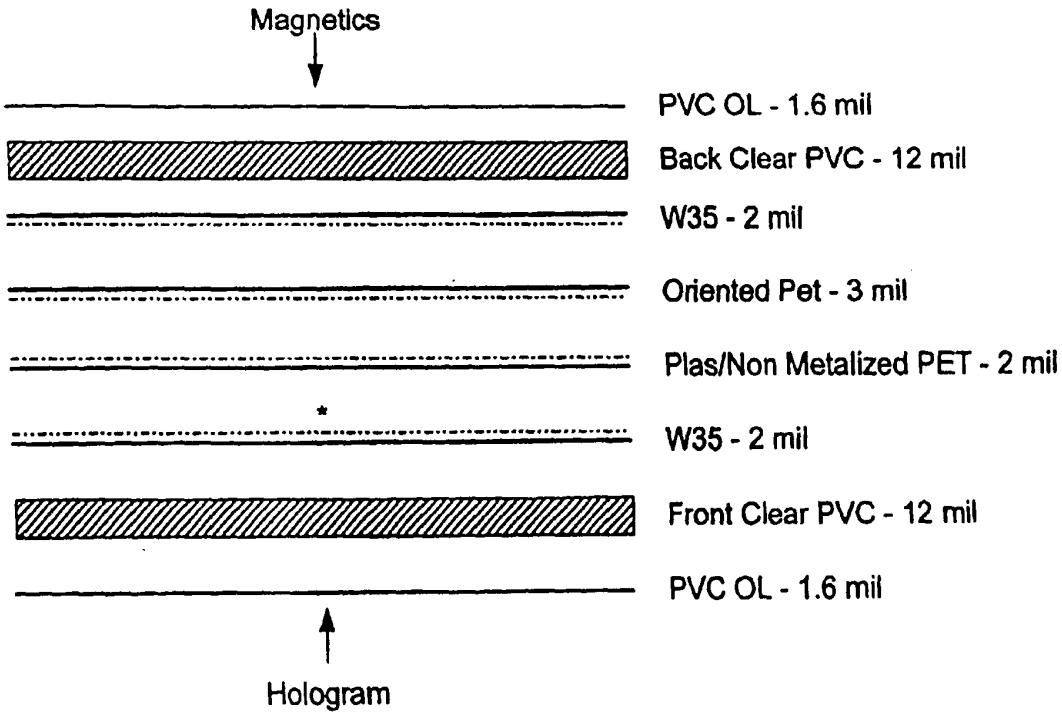

Magnetics
PVC OL - 1.6 mil
Back Clear PVC - 12 mil
W35 - 2 mil
Oriented Pet - 3 mil
Plas/Non Metalized PET - 2 mil
W35 - 2 mil
Front Clear PVC - 12 mil
PVC OL - 1.6 mil
Hologram

FIGURE 11E

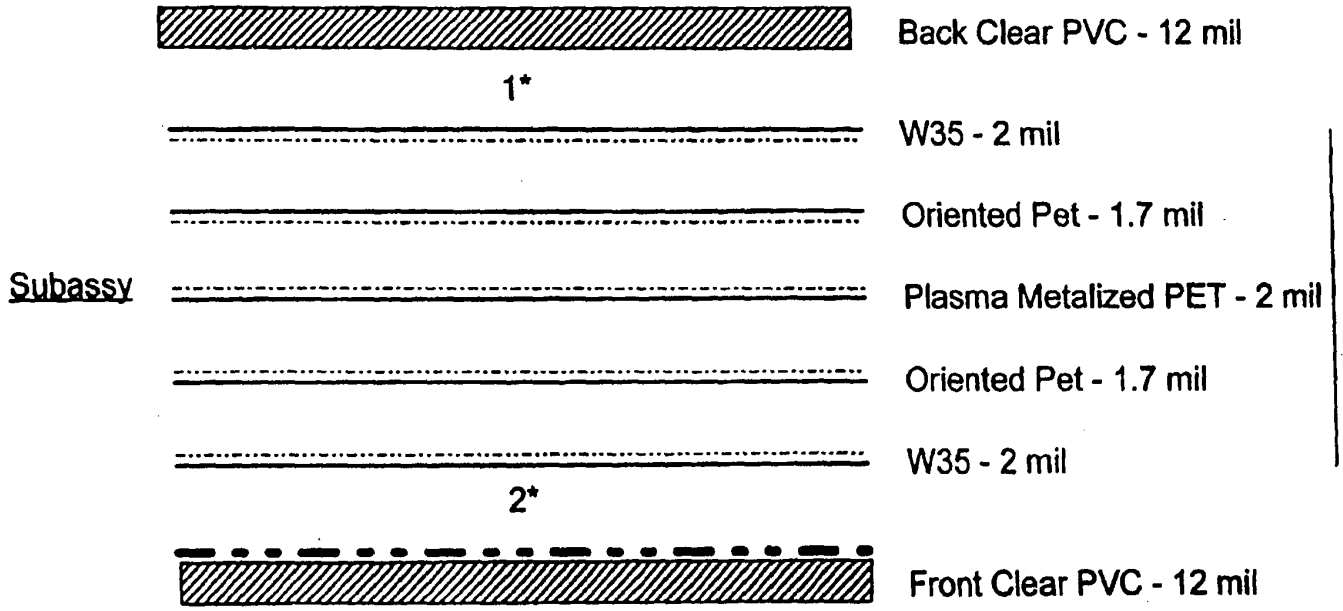

Back Clear PVC - 12 mil
1*
W35 - 2 mil
Oriented Pet - 1.7 mil
Subassy
Plasma Metalized PET - 2 mil
Oriented Pet - 1.7 mil
W35 - 2 mil
2*
Front Clear PVC - 12 mil

FIGURE 11F

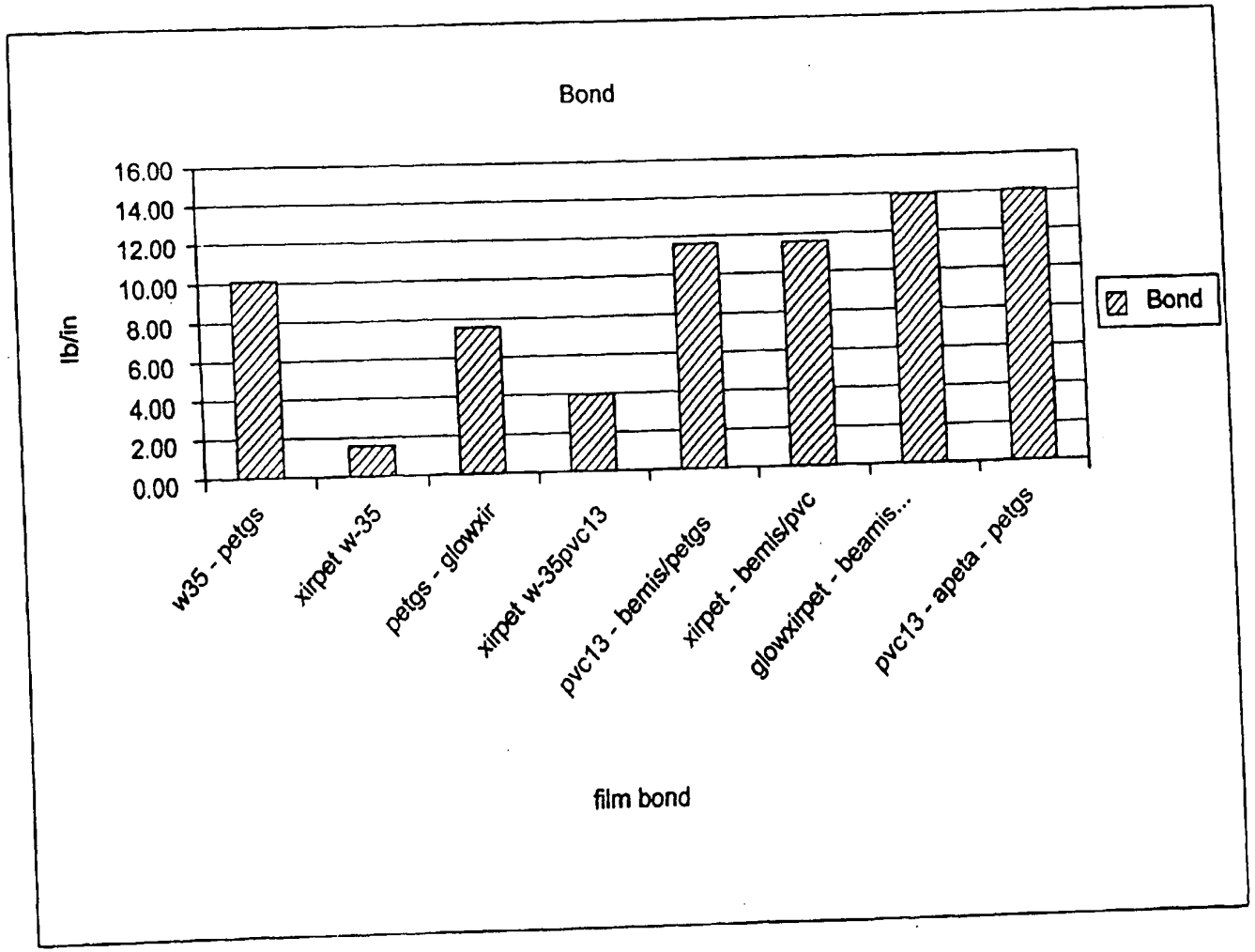

Bond
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
lb/in
Bond
w35 - petgs
xirpet w-35
petgs - glowxir
xirpet w-35pvc13
pvc13 - bemis/petgs
xirpet - bemis/pvc
glowxirpet - beamis...
pvc13 - apeta - petgs
film bond

FIGURE 12A

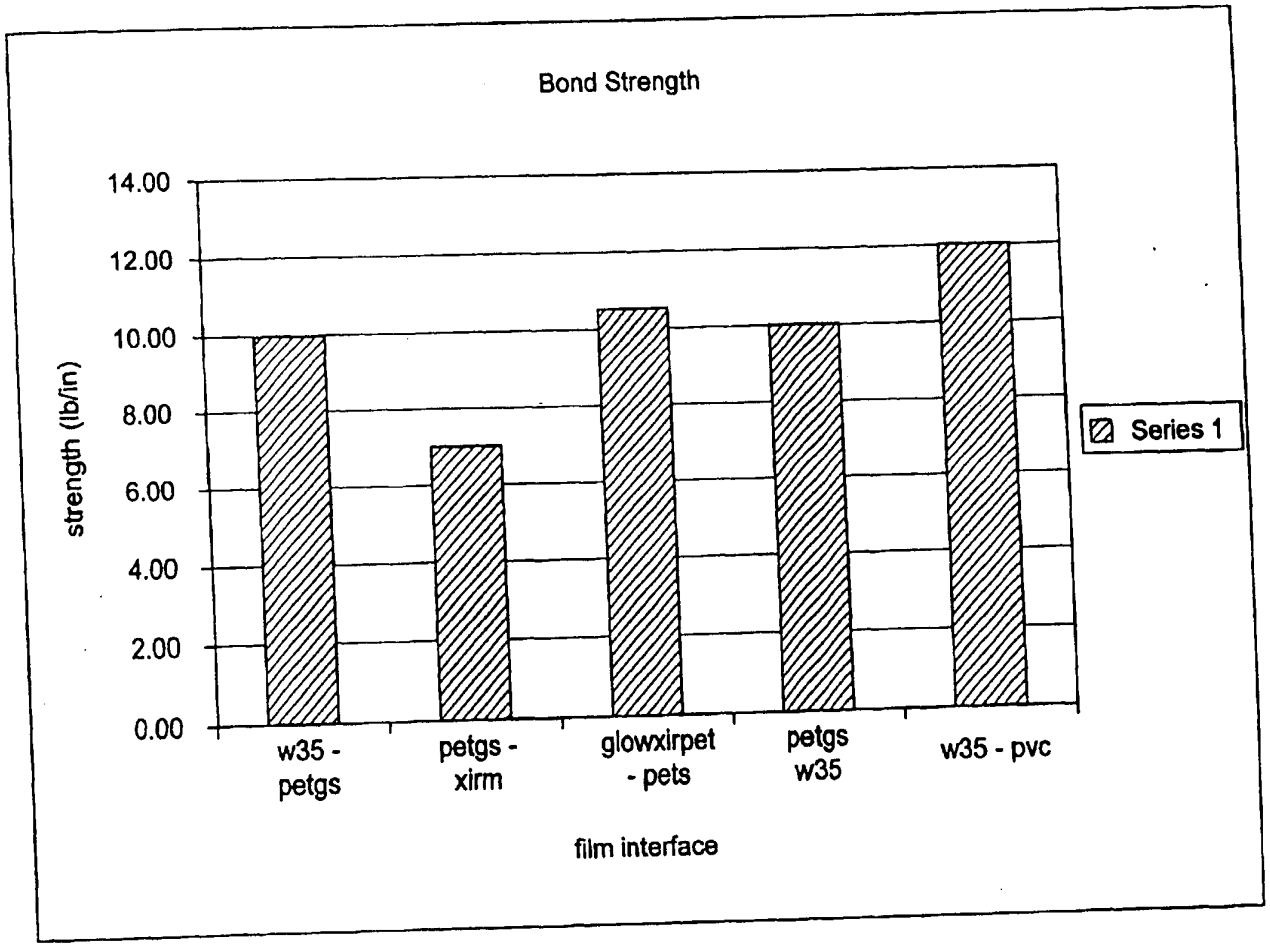

Bond Strength
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
strength (lb/in)
w35 - petgs
petgs - xirm
glowxirpet - pets
petgs w35
w35 - pvc
film interface
Series 1

FIGURE 12B

Number	Material	Specifications	Source	Comments
	Construction 1 - white needs work, lamination temperature too low, pvc core			bond low.
1	pvc laminate	1.60	oberthur	front 4.1, 4.4; back 4.0, 4.0
2	pet adhesive both sides	2.50	allied signal	
3	printed core - white #1	12.00	oberthur	
4	printed core - white #1	12.00	oberthur	
5	wl-35 pvc (adh to xir)	2.00	klockner	
6	xir (metal to pet gs)	1.00	southwall	
7	pet glue/stamp	1.70	d & k	1.2 mil adhesive, 0.5 mil pet.
Total		32.80		thickness .030 - .031
	Construction 2			
1	pvc laminate	1.60	oberthur	
2	pet adhesive both sides	2.50	allied signal	
3	printed core	12.00	oberthur	
4	printed core	12.00	oberthur	
5	wl-35 pvc (adh to xir)	2.00	klockner	
6	xir (metal to pet gs)	1.00	southwall	
7	pet glue/stamp (adh to xir)	1.70	d & k	1.2 mil adhesive, 0.5 mil pet.
8	wl-35 pvc (adh to pet)	2.00	klockner	
Total		34.80		
	Construction 3			
1	pvc laminate	1.60	oberthur	
2	pet adhesive both sides	2.50	allied signal	
3	printed core	12.00	oberthur	
4	printed core	12.00	oberthur	
5	wl-35 pvc (adh to xir)	2.00	klockner	
6	xir (metal to pet gs)	1.00	southwall	
7	pet glue/stamp (adh to xir)	1.70	d & k	1.2 mil adhesive, 0.5 mil pet.
8	gomar pvc (adh to pet)	2.00	allied signal	
Total		34.80		
	Construction 4 - white #2 too dark, temperature too low, pvc lamination bond			low
1	pvc laminate	1.60	oberthur	front - 4.0, 4.3; back tear
2	pet adhesive both sides	2.50	allied signal	
3	printed core - white #2	12.00	oberthur	
4	printed core - white #2	12.00	oberthur	
5	bemis (adh to xir)	2.00	klockner	
6	xir (metal to pet gs)	1.00	southwall	
7	pet glue/stamp	1.70	d & k	1.2 mil adhesive, 0.5 mil pet.
Total		32.80		thickness .030 - .031
	Construction 5 - white #3 too dark, temperature too low - pvc lamination bon			low
1	pvc laminate	1.60	oberthur	
2	pet adhesive both sides	2.50	allied signal	
3	printed core - white #3	12.00	oberthur	
4	printed core - white #3	12.00	oberthur	
5	w-35 (adh to xir pet)	2.00	klockner	
6	xir (metal to pet gs)	1.00	southwall	
7	pet glue/stamp	1.70	d & k	1.2 mil adhesive, 0.5 mil pet.
	Total	32.80		thickness .030 - .031
	howard 1.0 coating			
1	neocryl b725	33.60	zeneca?	
2	EtOH	31.20		
3	nPOAc	31.20		

FIGURE 13

	4	citraflex a4	4.00	moreslip, greensboro	
Total			100.00		
		construction #6 - seems to stick ok, best so far, scale up. Make sub-laminat			(aka - s)
	1	pvc laminate	1.60	oberthur	
	2	core pvc	12.00	oberthur	
	3	bemis	2.00	bemis	
	4	petgs	1.70	d & k	
	5	xir (metal to pet gs)	1.00	southwall	plasma treated
	6	bemis	2.00	bemis	
	7	core pvc	12.00	oberthur	
	8	pvc laminate	1.60	oberthur	magnetics
Total			33.90		
		herslow sublamination			
Total Price					
		construction #7-- seems to stick ok, best so far, scale up. Make sub-laminat			(aka - t)
	1	pvc laminate	1.60	oberthur	
	2	core pvc	12.00	oberthur	
	3	w-35	2.00	bemis	
	4	petgs	1.70	d & k	
	5	xir (metal to pet gs)	1.00	southwall	plasma treated
	6	bemis	2.00	bemis	
	7	core pvc	12.00	oberthur	
	8	pvc laminate	1.60	oberthur	magnetics
Total			33.90		
		construction #7 - seems to stick ok, best so far, scale up. Make sub-laminat			(aka - t)
	1	pvc laminate	1.60	oberthur	
	2	core pvc	12.00	oberthur	
	3	w-35	2.00	bemis	
	4	petgs	1.70	d & k	
	5	xir (metal to pet gs)	1.00	southwall	plasma treated
	6	w-35	2.00	bemis	
	7	core pvc	12.00	oberthur	core to core = 14.2 lb.in.
	8	pvc laminate	1.60	oberthur	magnetics
Total			33.90		
		construction #8 - sublaminate to be used with 12 mil pvc core			
	1	w-35	2.00		
	2	petgs	1.70		
	3	xir (metal to pet gs)	1.00		
Total			4.70		
		construction #9 - sublaminate to be used with 10 mil pvc core			
	1	pvc laminate	1.60		
	2	w-35	2.00		
	3	petgs	1.70		
	4	xir (metal to pet gs)	1.00		
	5	bemis	2.00		
	6	pvc laminate	1.60		
Total			9.90		
		construction #10 (if u works)			
	1	w35	2.00		
	2	petgs	1.70		
	3	xir (metal to p t gs)	1.00		
	4	w35	2.00		

FIGURE 13 (Continued)

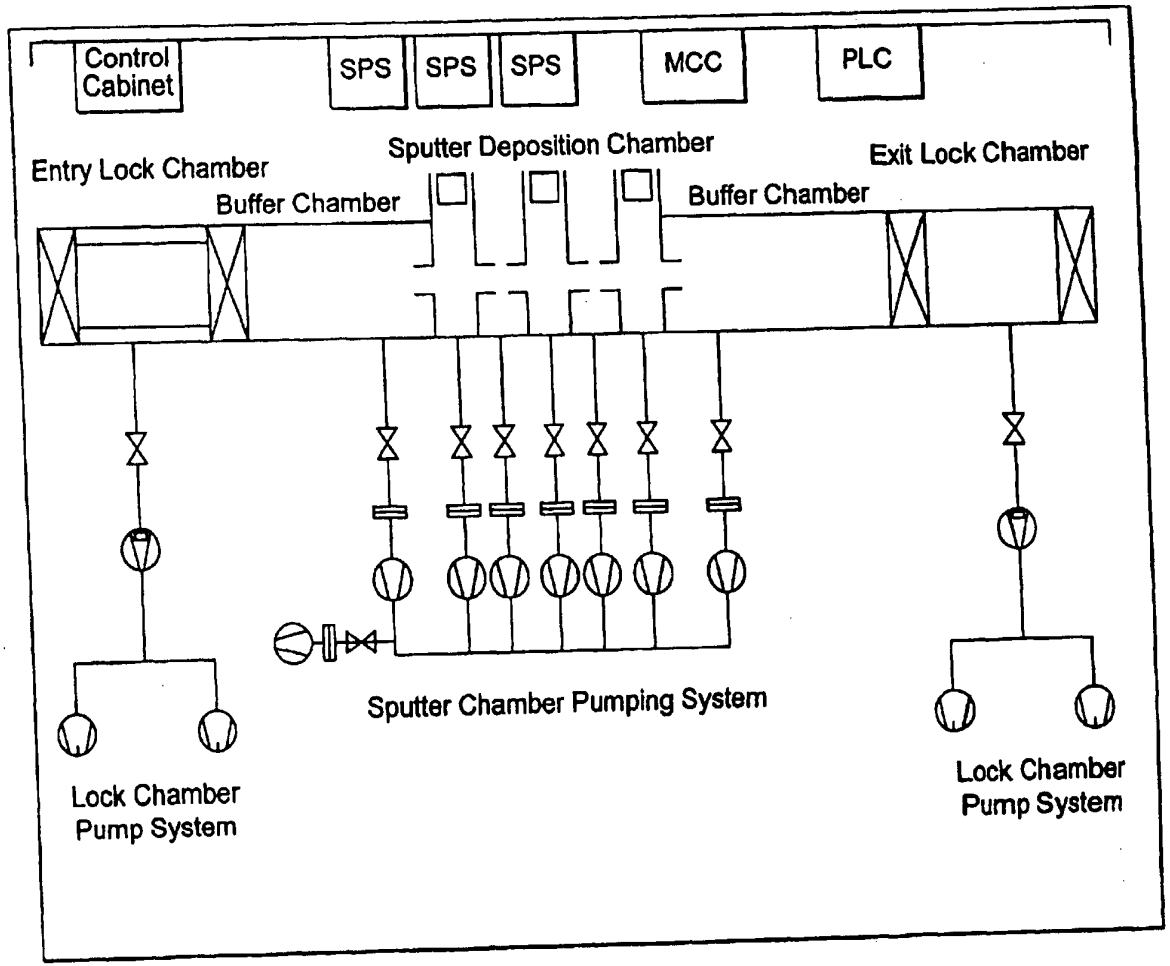

Control Cabinet
SPS
SPS
SPS
MCC
PLC
Entry Lock Chamber
Buffer Chamber
Sputter Deposition Chamber
Buffer Chamber
Exit Lock Chamber
Sputter Chamber Pumping System
Lock Chamber Pump System
Lock Chamber Pump System

FIGURE 14

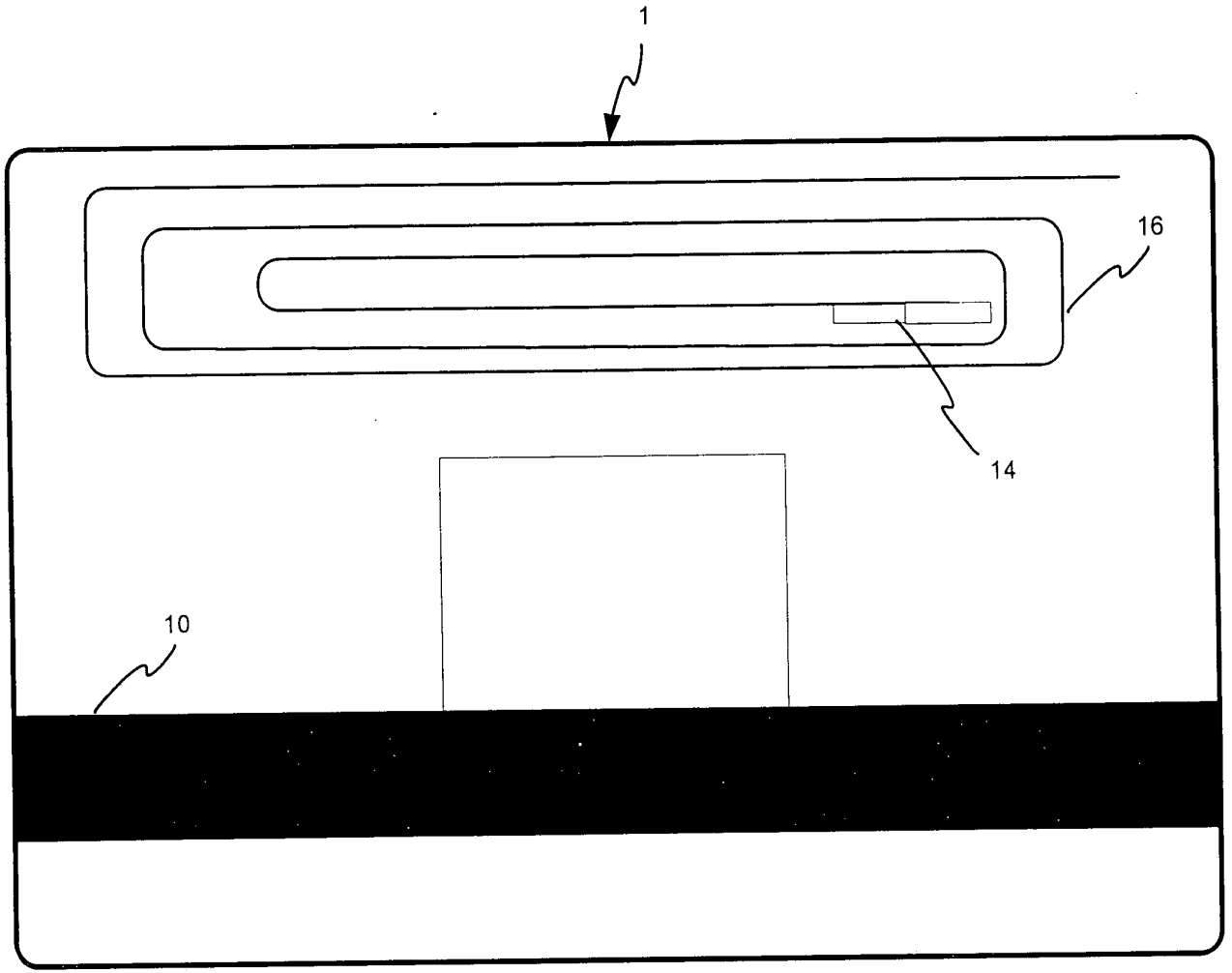


FIGURE 15A

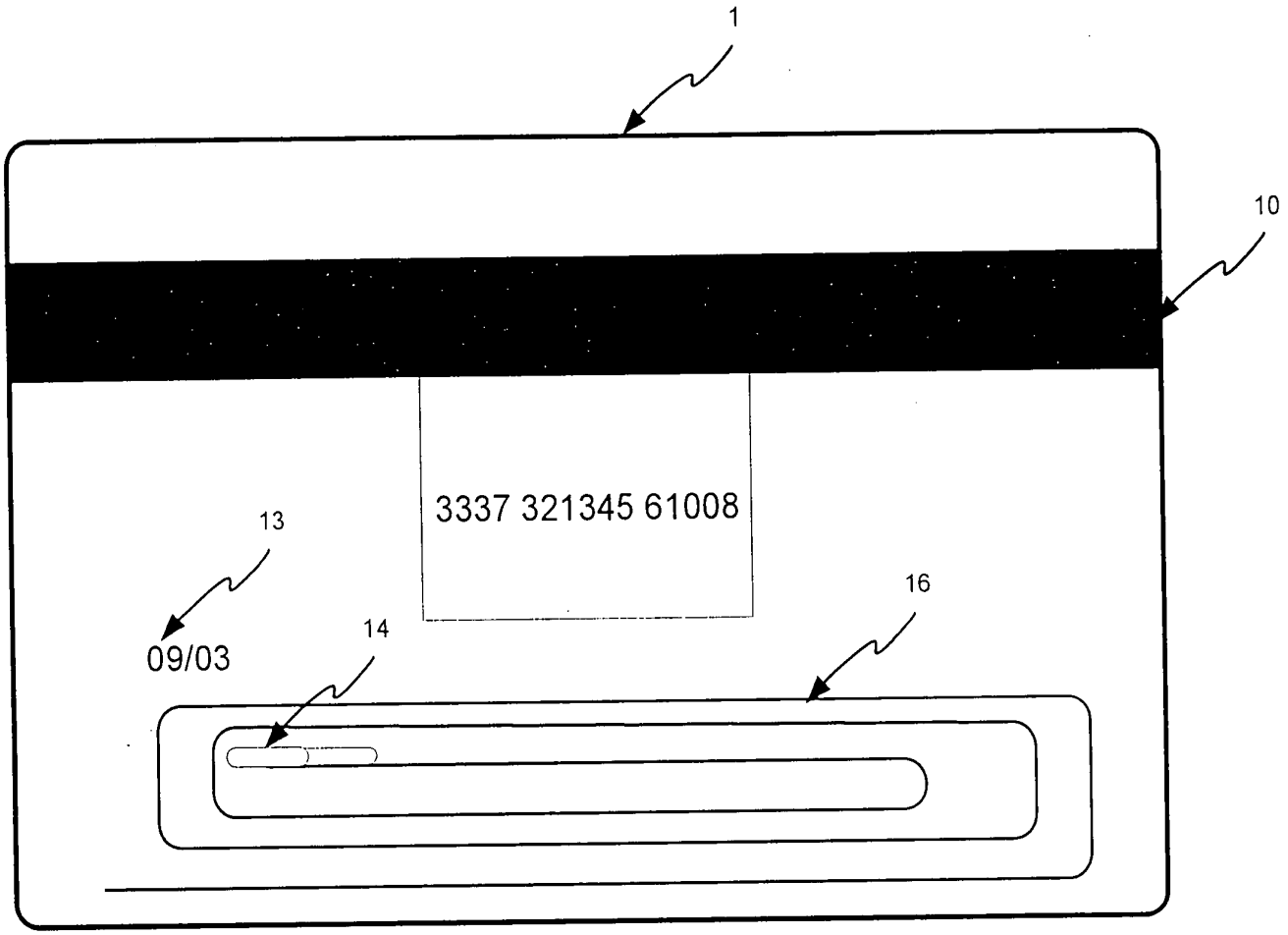


FIGURE 15B

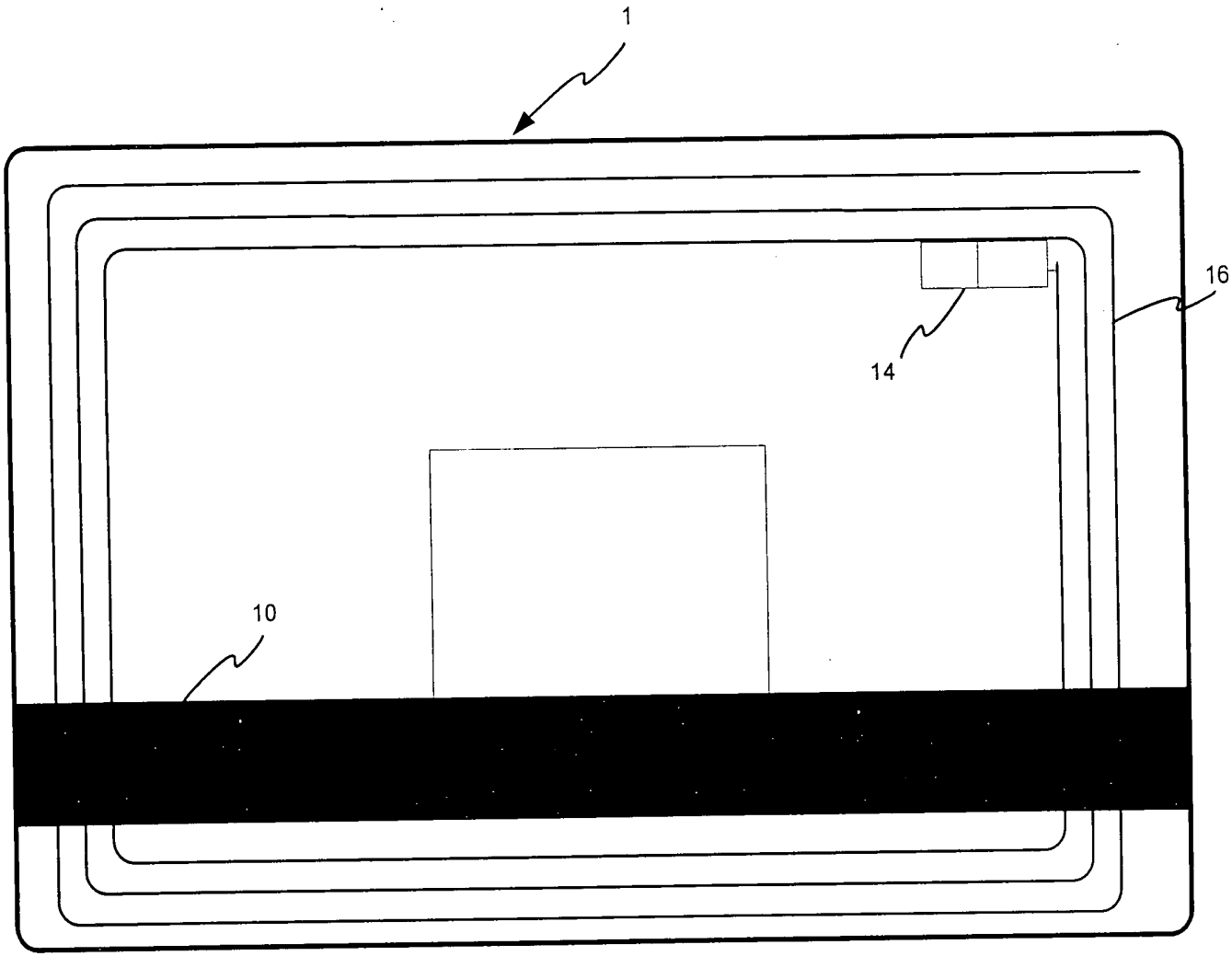


FIGURE 16

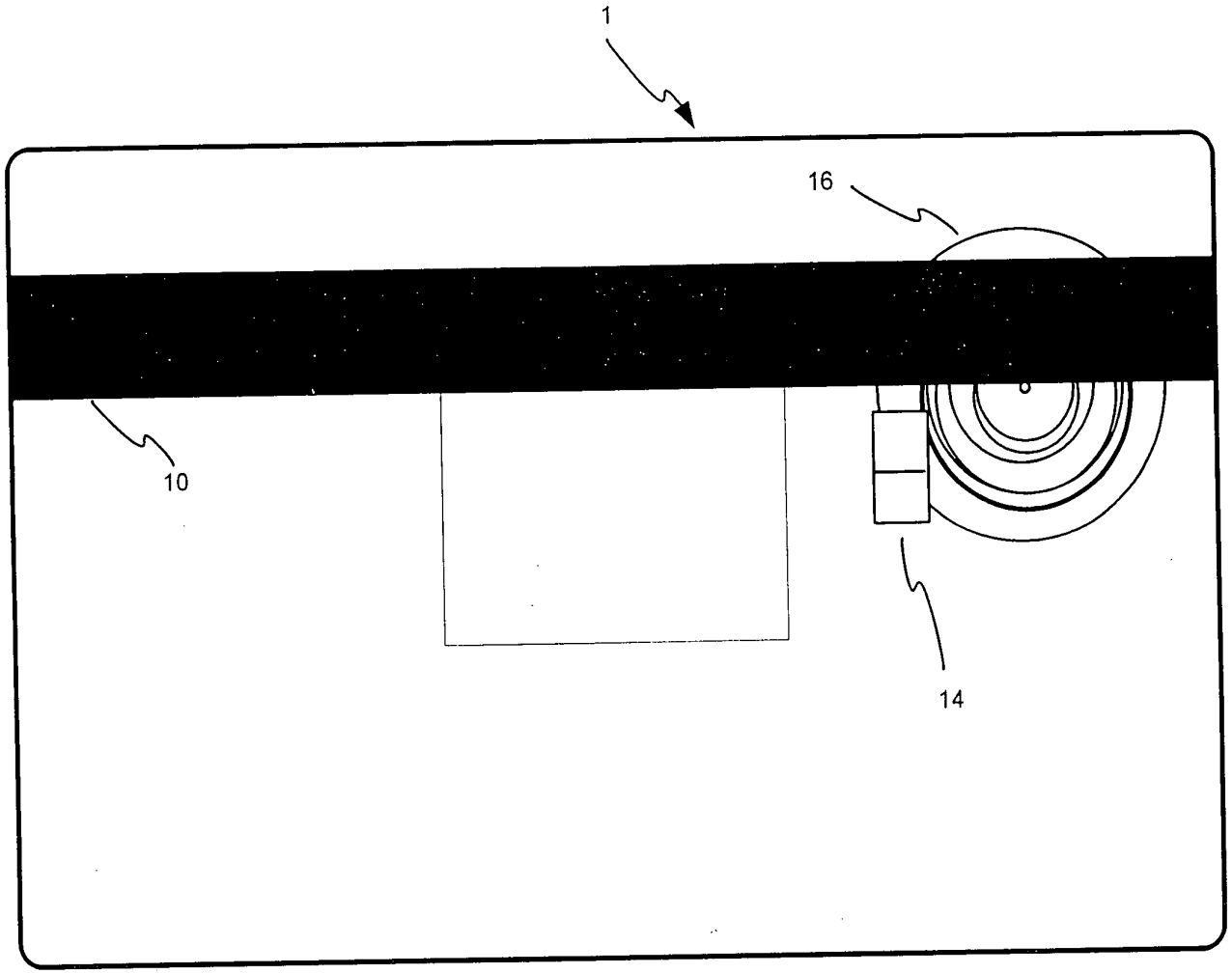


FIGURE 17

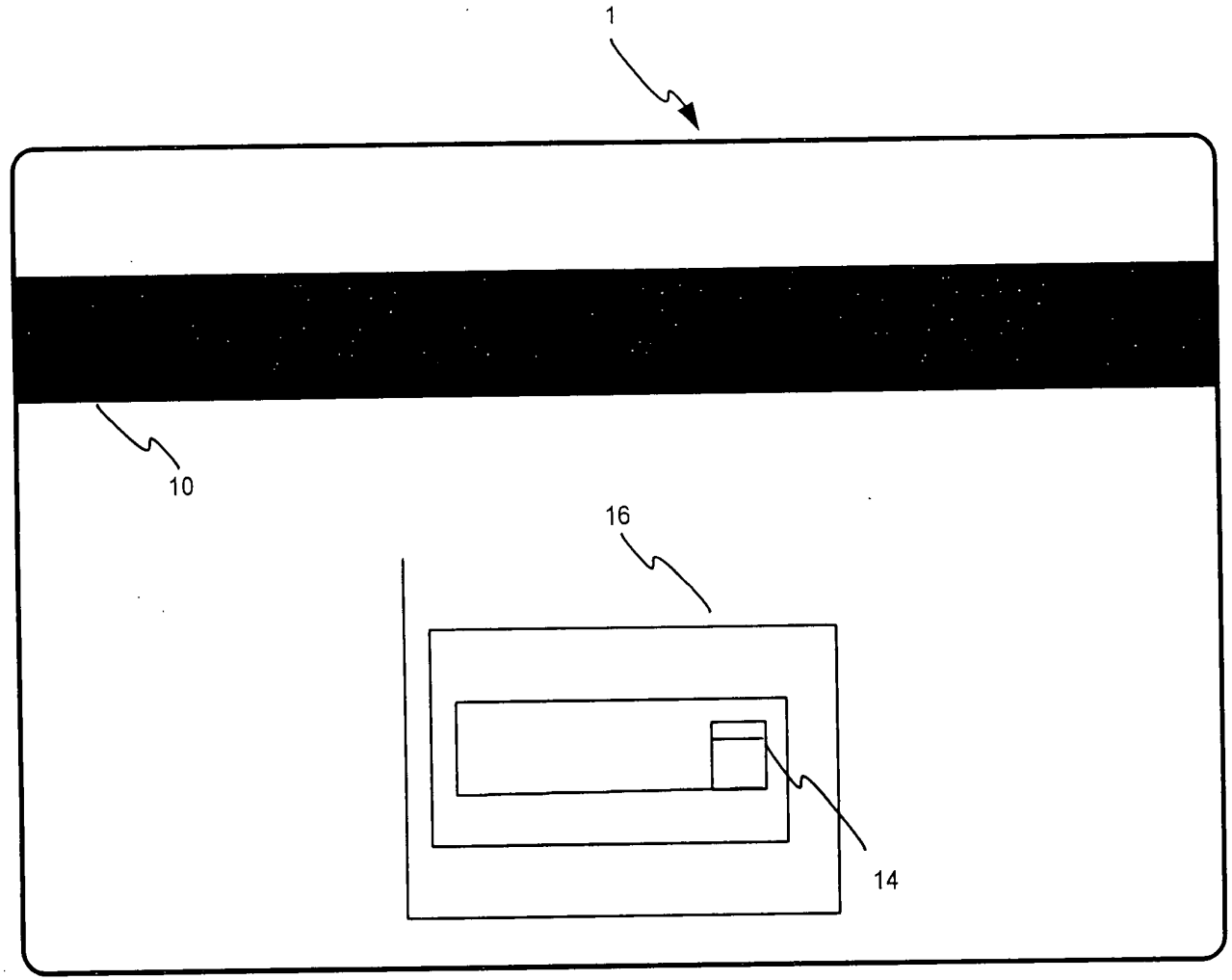


FIGURE 18